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Electric Street Lighting.

IT was somewhat of a departure for two such papers as those by Mr. J. W. T. Walsh and Lieut.-Commander Haydn T. Harrison to be presented before the Institution of Electrical Engineers, for the discussion of illumination has taken place mainly before the Illuminating Engineering Society since it came into being about 17 years ago. The fact that it is possible to devote so much attention to illumination, and to attempt standardisation in lighting matters, is due mainly to the pioneering work carried out during those 17 years.

Readers of Mr. Walsh's paper (which was abstracted last week) will perhaps hardly form an adequate idea of the part which this Society has played in developing the subject of illumination, though in Mr. Harrison's paper (an abstract of which will be found elsewhere in this issue) allusion is made to the memorable paper read before it by Mr. A. P. Trotter in 1913, which may be said to contain the genesis of the idea of a specification for street lighting. A feature of the discussion was Mr. C. C. Paterson's contribution, summarising the chief features of the British Standard Specification for Street Lighting, which has been drafted by the B.E.S.A. Sub-Committee. Mr. Paterson again presented a summary of the specification at the meeting of the Illuminating Engineering Society at the G.E.C. Research Laboratories on March 8th, when there was a particularly useful and informative discussion. It was undoubtedly a happy idea to present the specification in draft form for comment by the chief societies interested. Opinion seems generally favourable to the specification, which represents the results of two years' patient work, and is framed on lines not dissimilar to those followed in 1913.

The classification of streets is again based on ascending values of minimum horizontal ("mid-span") illumination, from 0.02 up to 2 ft.-candles. It is true that there can, at present, be very few streets in Class A, with a minimum illumination of 2 ft.-candles, and the inclusion of this class seems soewhat optimistic. but if main thoroughfares could be illuminated to the value indicated in Class B (min. 1 foot-candle), this would be a great advance. It was pointed out that at the time of Mr. Trotter's paper the fundamental idea

of grading streets in terms of minimum horizontal illumination was strongly contested in some quarters, but it is probable that the principle will be widely accepted to-day as the best compromise possible. A good feature is the specification of heights of light sources, with a maximum of 30 ft. and a limiting value of 12 for the spacing ratio. The fixing of heights should be helpful in avoiding glare, and in an appendix a method of determining a coefficient, which is an approximate measure of the effect of the glare on the ability of the user of the road to perceive detail, is outlined. This method is based on the reasoning and formulæ set out in Mr. Walsh's recent paper, and is believed to be a novel treatment of the subject of glare. The problem of framing a clause to limit glare in street lighting is obviously difficult: it was suggested in the discussion that the process would appear somewhat involved to the uninitiated, and it was also urged that the fact that the formula only included candle-power and height, apparently taking no account of the degree to which the source was screened by diffusing glassware, seemed anomalous. Other points raised in the discussion dealt with procedure in testing, and a useful communication from Mr. Colquhoun, public lighting engineer in Sheffield, was presented, dealing with the specification from a practical standpoint. There was general recognition of the great value of the work which the British Engineering Standards Association's Sub-Committee had performed, and the difficulty of its task; no doubt the comments made during the I.E.S. discussion will be helpful in enabling it to deal with any points in the Specification which are still not clear and require elucidation.

Standardisation in the United States.

At the winter convention of the American Institute of Electrical Engineers, which was held at New York City last month, the question of simplifying the voltage ratings in vogue occupied a prominent position in the programme, two entire sessions being devoted to a discussion on this subject, which is reported in the *Electrical World* of February 19th. It was stated by representatives of the big manufacturing companies that special electrical apparatus in use in the United States, valued at from 100 to 200 millions sterling, had cost from 20 to 40 millions more than it would have done if standard apparatus could have been used.

The whole range of rated voltages from the generator (13,200 V) and step-up transformer (132,000 V) through four steps down to the ultimate lamp voltage was mapped out and studied. It appears that the three common lamp voltages of 110, 115, and 120 V must be retained, but the tendency is to regard 115 V as the normal, with 230 V between the outers of d.c. three-wire systems. Where a.c. distribution is used, the voltages may be 115 and 199 or 200. Obviously the low lamp voltage entails difficulties with motors and other devices absorbing large powers, and we may congratulate ourselves on having to a great extent escaped that drawback by our bold adoption of the double voltage many years ago; there remains abundance of scope for further unification of our voltages, which is a very pressing need, but the majority of our systems are operating at declared pressures which, at least, are of the right order.

With regard to the generation and transmission voltages, United States engineers are grappling with a huge problem which will also enter on an acute phase in this country when the Central Electricity Board's operations begin to take effect. For instance, the interchange of power which forms so prominent a feature of the Government scheme involves the use of interchangeable step-up and step-down transformers, in order to transfer energy in either direction at pleasure. On the other hand, this calls for a voltage range of 25 per cent., involving heavy expense, whether it be provided by voltage taps or induction regulators, especially as such changes of voltage will have to be made under load. From the report of the discussion in our contemporary, it appears that there is a general feeling in favour of unification of voltages, as would be expected, but considerable diversity of opinion as to the most desirable schedule of voltage ratings and no little perturbation with regard to the cost of changing existing plant. There is in the United States no central authority, such as our Electricity Commission, to deal with such problems, and whilst individual and unrestricted enterprise has been one of the principal factors in the rapid development of electricity in that country, it appears to render the solution of the standardisation problem more difficult of attainment.

Edison's Birthday.

The eightieth birthday of Mr. T. A. Edison was celebrated on February 11th at a luncheon given in his honour in Newark, N.J., by the "Edison Pioneers"; the report in the *Electrical World* states that a message was read from President Coolidge, acknowledging the debt owed by the world to his energy, courage, industry, and strong will, and Mr. Samuel Insull expressed his pride in having served for nearly half a century in a company bearing the name of Edison. There was a large gathering of men who had been associated with the work of Edison before the year 1886, full members of the club, and of associate members—those who were connected with his work between 1885 and 1900. After the luncheon Mr. and Mrs. Edison held a reception at their home, and it is alleged that "Mr. Edison took the whole day off and was late to work next morning."

On February 11th we published a brief appreciation of his career, and telegraphed to him: "London Electrical Review sends most cordial greetings on your eightieth birthday." Last week-end we were gratified to receive from him the following acknowledgment, dated February 23rd, from his laboratory at Orange, New Jersey:—

"Gentlemen,—

"My friends have helped to make my recent birthday a notable and pleasant one. Your message of congratulation and good-will was received and appreciated, and gives me the opportunity to greet and to thank you for your kind remembrance of the occasion.

"Yours sincerely,

"Thos. A. Edison."

Electricity and Gas at Retford.

We have often pointed out that the generation of gas and electricity jointly offered a prospect of effecting material economy in the consumption of coal. In August, 1924, Mr. J. R. Bradshaw, at that time engineer and manager of the Retford Corporation Gas and Water Works, in our "Correspondence" columns expressed the same view, and stated that on his advice his Corporation had taken steps to obtain powers to generate electricity at the gas works, in conjunction with the gas department; and in our issue of April 3rd, 1925, Mr. G. M. Gill, a well-known gas engineer, discussed the question quantitatively, showing that by the use of waste heat, coke breeze, &c., resulting from gas manufacture, a considerable quantity of electricity could be economically produced.

Mr. Bradshaw's proposition has now been carried into effect, and we publish to-day some particulars of the Retford undertaking. In this case the waste heat is used for driving a 50-kilowatt generating set, whilst the larger sets are driven by gas. As the waste-heat set runs almost continuously, on a high plant load factor, it turns out a relatively large amount of "cheap units."

It will be noticed that the larger sets generate at 6,600 volts, a high pressure for a small undertaking; the inference, we take it, is that it is intended to carry the supply into the surrounding country at an early date. Twenty years ago the supply would almost certainly have been direct current—but we have passed that stage.

Retford Electricity Supply.

A small electricity undertaking designed for working in conjunction with a gas works, utilising the waste heat from the retort house, and embodying some novel self-contained transformer units on the distribution system.

WHAT is believed to be the first electricity supply undertaking in this country to work in conjunction with a gas works, utilising the waste heat from the retort house for generating electricity for public supply, with the two concerns under joint management, has been recently established and put on load at Retford, Nottinghamshire, and will be officially inaugurated on March 21st.

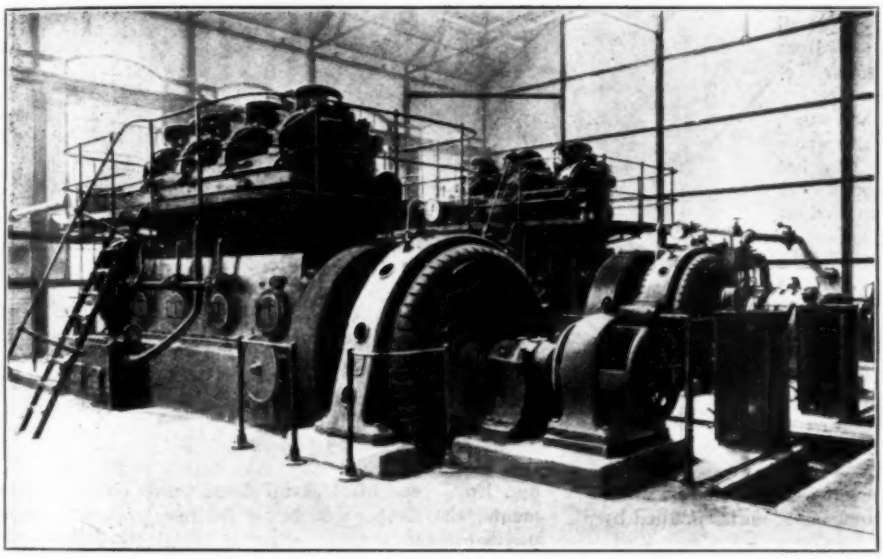


Fig. 1.—Gas-Engine Generating Plant.

A Special Order for the Retford area, 200 sq. miles, was granted to the Corporation last year, and sanction was obtained from the Electricity Commissioners for the construction of a generating station. This has been put down in the gas-works yard. The building is a plain steelwork structure with brick filling and "Asbestolite" roofing.

The main generating plant at present consists of two gas engines, fig. 1, one 4-cylinder, 400 h.p., and the other 3-cylinder, 300 h.p., supplied by the National Gas Engine Co., Ltd., directly coupled to 270- and 200-kW alternators, respectively, 3-phase, 6,600 V, 50 cycles, and the necessary exciters. The alternators were supplied by the Electrical Construction Co., Ltd., the main contractors for the generating plant. The cylinders of the engines are standardised and interchangeable. The machines are supplied with gas direct from the holders. They start on compressed air at 350 lb./sq. in. and are provided with the usual electrical-ignition arrangements. Two compressors, fig. 2, one driven by a small National gas engine and the other electrically driven by a G.E.C. motor, supply the necessary starting air to conveniently arranged bottles. Unusual difficulties were met with when putting down the foundations for the main engines, owing to the existence 10 ft. below the surface of a bed of running sand about 5 ft. 6 in. thick. They were overcome by drilling out 12-in. diameter cores to a depth of 22 ft., and casting piles *in situ*, afterwards placing very heavy concrete beds on the piles and filling in the running-sand space below the beds with liquid or "milk" cement, the latter being pumped into the ground at 300 lb./sq. in. so as to replace the sand. This work was carried out by the Francois Cementation Co., Ltd., and it is said to be the first time that such foundation work has been effected in this country.

The alternators supply direct to a truck-type e.h.p. E.C.C. switchboard, fig. 3, from which the supply is transmitted at the generating pressure.

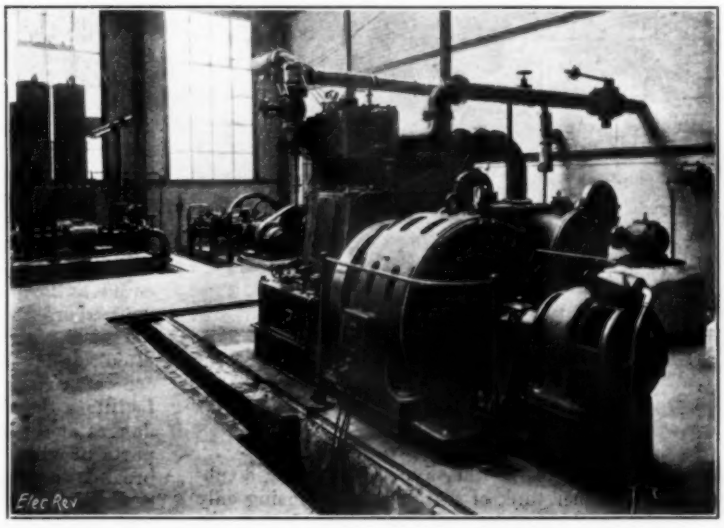


Fig. 2.—Steam Plant and Pumps.

The waste-heat plant consists of a horizontal tubular boiler, supplied by Messrs. Spencer Bonecourt, Ltd., in the retort house, and a small Belliss & Morcom condensing steam engine and auxiliaries, fig. 2, in the

power station. The hot gases are taken from the main flue of the gas plant by means of an electrically driven Sirocco fan and passed through the boiler, and the steam from the boiler is passed through a superheater contained in a chamber near the main flue. The boiler is designed for a working pressure of 120 lb. per sq. in. The feed water is taken from a Spencer Bonecourt vertical waste-heat boiler, fig. 4, which is positioned outside the power house and fed by both the exhaust and the cooling water from the gas engines. This plant also serves effectively as a silencer for the exhaust.

The steam engine is directly coupled to a 50-kW E.C.C. alternator, which generates at 400 V, 3-phase, the pressure of the l.p. supply network. A 2-panel E.C.C. slate switchboard, fig. 3, deals with the l.p. supply from the steam-driven plant. In conjunction with this and a small generating set used in the gas house for supplying power to the stoking machine, a small motor-generator serves as a medium for the interchange of power between the respective works.

The condensate from the steam plant with the cooling water from the gas engines is collected in a hot well, from which it is pumped over a cooling tower, fig. 4, supplied by the Visco Engineering Co., Ltd. From the cooling-tower tank the water is pumped to an overhead storage tank. The make-up water is taken from the town supply. The pumping requirements are dealt with by two double-pump motor-driven sets, fig. 2. In each case the central motor drives two turbine pumps, one for delivery to the cooling tower and one to the storage tank. The pumping equipment was supplied by Messrs. Mather & Platt, Ltd. The engine room is spanned by a 10-ton Morris hand crane.

In connection with the distribution system, some specially designed equipment in the form of distribution units is of particular interest. Each of these comprises all that is necessary for the complete control of a distribution section, taking power from the e.h.p. mains. The principal feature is the cutting out of the usual brick or steel transformer

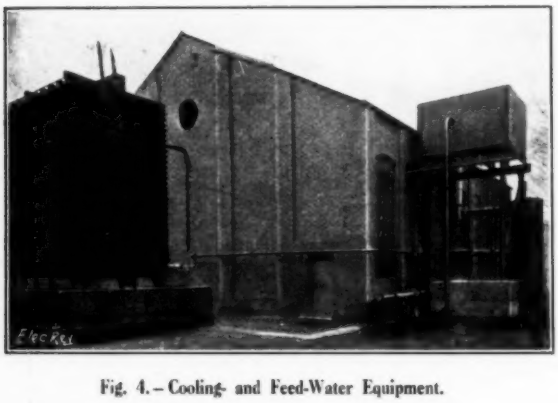


Fig. 4.—Cooling- and Feed-Water Equipment.

chambers, kiosks, and the like, and, by adopting a substantial transformer tank of suitable design, using only one "enclosure," thereby reducing the capital cost considerably, and also the heating losses.

In each case a pillar, containing in its base the necessary e.h.p. trifurcating boxes for both the high- and low-pressure cables, and permanently fixed to the ground, provides for the necessary connections to the unit. The tails from the e.h.p. cables are taken to three well-insulated pockets at the top of the pillar. Similarly with the l.p. cables, but in more recently designed equipment the cable pillar is rather larger, and houses l.p. fuse-link units, thus forming a low-pressure distribution pillar. The l.p. busbars are then connected to four sockets at the top of the corresponding section of the pillar.

The transformer portion of the apparatus is entirely separate from the pillar, and the enclosure is electrically welded throughout. Above the transformer proper, and forming part of the same structure, is a steel chamber accommodating the control apparatus, which is contained in two separate compartments on opposite sides for the division of the two classes of equipment, e.h.p.

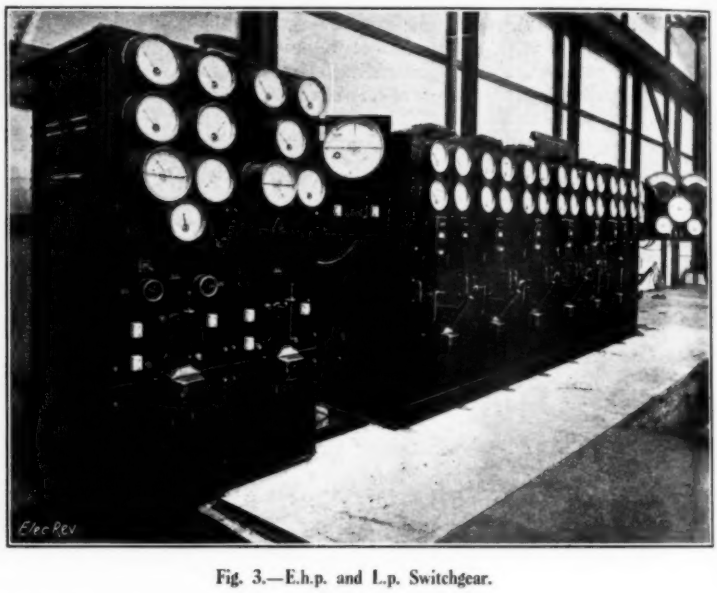


Fig. 3.—E.h.p. and L.p. Switchgear.

and l.p. Separate lock-up doors serve these compartments, the e.h.p. side being further protected by expanded-metal screens suitably interlocked with the switchgear. Corresponding to the sockets provided in the cable pillar, there are connecting plugs on the side of the apparatus chamber, so that there are no cable connections whatever between the two sections, and the transformer, with the control apparatus, can be disconnected very easily from the main. The e.h.p. control gear includes a triple-pole isolating switch in series with three single-pole tetrachloride fuses, one on each phase.

On the l.p. side an ammeter is fitted for each phase and a voltmeter with a three-way switch to give the readings from each phase to neutral. An important feature is the l.p. voltage control. In each phase there are tappings in the l.p. winding connected to regulating switches which can be operated under load; thus the pressure between each phase and neutral can be adjusted independently. Scarcely any flicker can be seen on the voltmeter when these switches are operated. By this arrangement it is possible to deal economically with low load factors, such as are likely to be experienced at Retford, by using small cables even for long runs where the drop at full load would, normally, be too great. The portable portion of the equipment is fitted with roller wheels, and short rails embedded in concrete are provided at the foot of the fixed pillar to facilitate the sliding in or out of position. Suitable flanges at the connection between the fixed and movable parts provide the necessary clamping. In the case of breakdown or other emergency, the transformer can be removed and another wheeled into position, plugged in and made alive, without interfering with the e.h.p. supply, the whole operation being much more quickly performed than changing a transformer in a sub-station.

At present three of these distribution units are installed on the system, two in the town and one in the works, but more will be added as the undertaking is

extended. The works unit is designed so as to be used for either stepping up or down, in order that either the e.h.p. or the l.p. system may be supplied from it.

Fig. 5 shows a 100-kVA distribution unit installed in the Market Place at Retford. The kiosk on the right accommodates three e.h.p. switches, arranged vertically one over the other in separate compartments, with the necessary provision for the lead-in of the cables and the trifurcating boxes, thus providing an e.h.p. distribution point. One of the switches, of course, serves the transformer equipment.

Fig. 6 shows the pillar of one of the more recent designs, which we understand is to be used on the new undertaking which is being carried out at Gainsborough.

The transformer units are interchangeable for any size up to 250 kVA, that is, any size of transformer up to that limit may be served by the same pillar. The contractors responsible for the design and supply of the transformer equipment are Messrs. Foster Engineering Co., Ltd.

Fig. 5.—100-kVA Distribution Equipment, Retford.

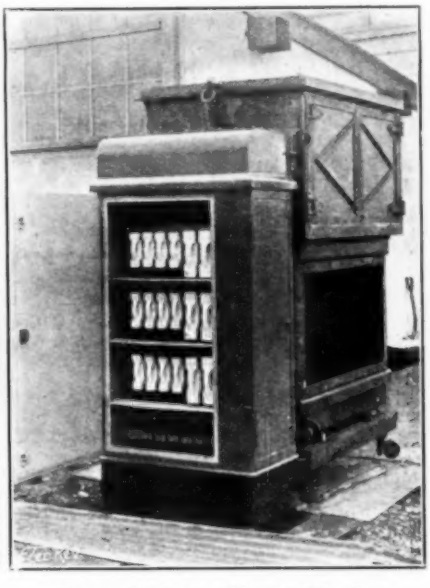


Fig. 6.—Distribution Unit with Pillar Fuses.

The consulting engineers responsible for the whole scheme are Messrs. A. Hugh Seabrook & Partners. Mr. S. O. Pacey, M.I.Mec.E., engineer and manager of the Corporation gas, water and electricity undertakings, supervised a considerable amount of the construction work entailed.

Voice-frequency Telegraphy.

Telegraphy at voice-frequency is a system that promises not only to facilitate operating arrangements, but also to lead to cabling economy; the development of the thermionic-valve repeater has made the method a practical proposition on underground telephone cable networks.

(COMMUNICATED.)

THE method of conveying telegraph signals at voice-frequency is sometimes referred to as tone-frequency signalling. It is a development of the method of tuning-fork signalling first tried some 70 years ago, and developed by the French scientist Mercadier towards the close of last century into a multiplex telegraph system having twelve channels of communication, each of which had a Morse key for signalling purposes and a mono-telephone for reception.

The actual signals which passed over the telegraph line came from a number of differently tuned tuning-forks, which were kept vibrating continuously and "making and breaking" connection with a signalling battery at a speed corresponding to their rate of vibration; when a Morse key associated with any particular tuning-fork was held down, the vibrating currents were passed through a transformer on to the line as alternating currents; each tuning-fork was tuned to correspond to the fundamental note of a particular steel diaphragm at the receiving end of the line, each diaphragm being supported on three points and situated above an electro-magnet. The electro-magnets were arranged to receive all the line signals, but the diaphragms responded only to the particular note proper to them; that is to say, to their relative keys at the sending end. Hence, it was practicable to send six different messages at the same time over the line, and for them to be properly sorted out by the mono-telephones. The arrangement proved to be workable, but it had disadvantages that made its adoption at that time quite uneconomical, chief among them being the disturbing noise that it produced on neighbouring telephone lines.

With the advent of the thermionic valve-amplifier, the currents which actuated the mono-telephones could be replaced by much weaker currents and then be augmented at the receiving end to make them suitable for actuating an ordinary telegraph relay, which in turn can actuate printing mechanism. With a valve-oscillator it is much easier to maintain, or to re-adjust,

the rate of vibration required for each channel of the multiplex telegraph line. The rates of oscillation used are kept within the range of the frequency of the human voice, *viz.*, from 300 to 2,000 oscillations a second; the current value on the line is kept to the value approximately of telephone currents, *viz.*, about one milli-ampere; and the voltage at the sending end of the circuit is about one volt. It thus becomes practicable to utilise this system of telegraphy on telephone lines, or cables, and through telephone repeaters. It is this fact that makes the use of voice-frequency telegraphy such an attractive feature at the present time when underground telephone cables containing small-gauge wires are being provided by most Administrations.

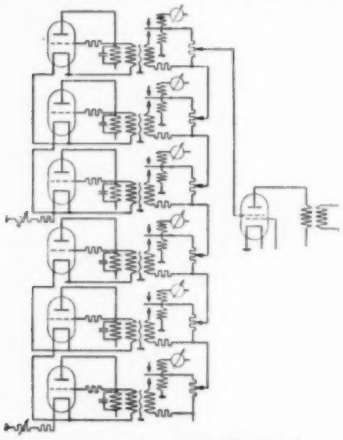


Fig. 1.—Sending Set for Six Frequencies.

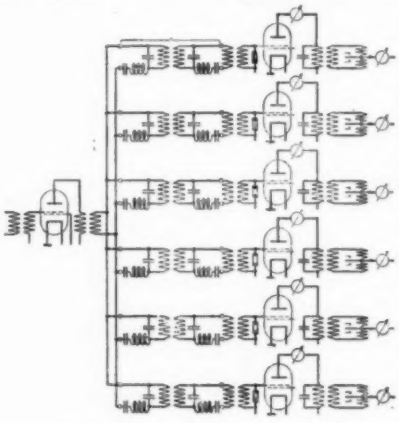


Fig. 2.—Receiving Set for Six Frequencies.

The underground-cable wires for long telegraph circuits of the ordinary type are much larger than those for telephone circuits, being as much as ten times larger in cross section, thus seriously limiting the number of circuits which can be provided in a cable of normal size, and, of course, are very much more costly. The inductive disturbance that may be caused by a modern voice-frequency telegraph system is no more than the cross-talk between ordinary telephone circuits, and is therefore practically negligible from the practical standpoint. The apparatus at telephone repeater stations serves equally well for repeating the voice-frequency signals as for ordinary speech, and there is consequently no need for the attendants at the repeater stations to be telegraphists, or as expert as the staffs at ordinary telegraph repeater stations.

Each frequency can be utilised to work a Wheatstone circuit at 100 words a minute, or a multiplex circuit with four or even more channels. The number of frequencies obtainable depends on the permissible margin between the frequencies, but ten separate channels have been provided and arrangements have been made for even twelve, giving the possibility of 48, or perhaps more, multiplex channels for each pair of telephone wires. Obviously this system can be employed on any circuit that is a practical telephone circuit, and, with some limitations, it can be utilised on circuits which are beyond the limit of commercial speech, by utilising only the lower frequencies.

The voice-frequency method of working is now being developed in Europe and America, and the following detailed information, kindly supplied by Messrs. Siemens & Halske, of Berlin, will indicate the progress that has been made with the system, which has been in daily use on the cables of the German Telephone and Telegraph Administration for several years. Fig. 1 shows the general principle of the arrangement for a sending end providing for six frequencies, *e.g.*, of 400, 638, 877, 1,110, 1,350, and 1,590 periods a second, produced by the valve-oscillators shown. The heating of their filaments is arranged in two sets of three in series, and the frequencies are obtained by adjusting the movable iron cores of the transformers. The amplitude of the frequencies sent out by each of the sending relays is regulated by a potentiometer; the six potentiometers are connected in series and to the grid of the amplifying valve, which passes all signals through a transformer to the line: by this arrangement the opening, or closing, of any of the transmitting relays does not cause any interference with the signals from any of the other transmitting relays. Each frequency produces about 0.2 volt at the sending end of the line, and when all six frequencies are working about one volt is impressed on the sending end. The currents traverse the line and pass through any telephone repeaters that may be necessary on the route in a similar manner to ordinary telephone currents. At the receiving end, fig. 2, the arriving currents pass through a transformer and to the grid of an amplifying valve, thence to six filters connected in parallel, each, of course, being adjusted to receive only the particular frequency corresponding to the particular telegraph communication it is serving. After each filter there is a detector valve which transforms the alternating currents into direct currents. The plate of each valve is connected to a transformer across whose coil is a condenser; thus, when a train of waves arrives at the grid of the valve, a direct current passes through the plate and the primary of the transformer; the secondary coil sends a momentary current through the relay, thus closing the local circuit. On the cessation of the train of waves, the plate-current ceases, causing a momentary reverse current in the secondary coil of the transformer and through the relay, thus opening the local circuit; the

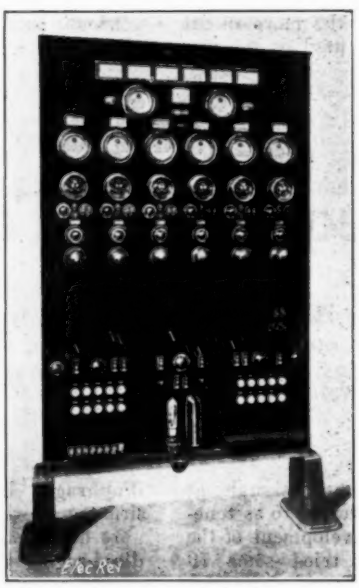


Fig. 3.—Transmitter Board, Six Frequencies.

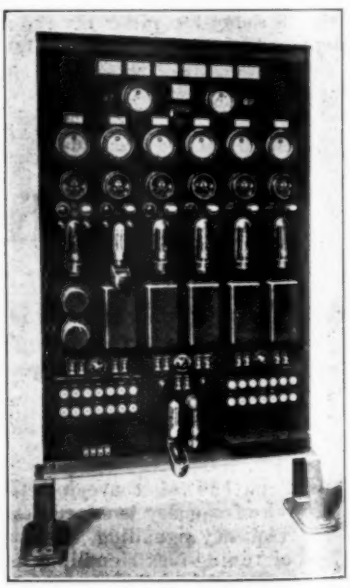


Fig. 4.—Receiver, Six Frequencies.

relay must be adjusted for neutrality, *i.e.*, so that its tongue will remain on either contact when no current is passing through its coils.

The apparatus for the sending end of a six-frequency set is shown in fig. 3: the section is divided into six sets of panels, each set being fitted with similar apparatus and made easily detachable and interchangeable with the others. Each panel of the centre set carries a galvanometer, a relay, an oscillating valve with protecting cover, and arrangements for regulating the frequency and amplitude; also a switch for introducing a suitable resistance in place of the lamp filament when any frequency is out of use; the latter precaution is essential, as the filaments are in two series of three. A control key is provided for actuating the relays when necessary, and a jack for the connection of a telephone for checking the frequencies, or for an amplifying voltmeter for measuring the amplitude of the frequencies. The lower panels are fitted with keys for speaking telephonically with the telegraph office and with the other voice-frequency transmitting station. The latter is usually arranged by superposing a telephone circuit on the two circuits used for the voice-frequency telegraph service, there being one circuit in each direction for a six-frequency service. The amplifying valve which passes all the six frequencies on to the line is situated in the middle of the lowest set of panels and is duplicated, so that should it cease to function, it will be automatically replaced by the reserve valve. On this panel there is also placed an adjustable resistance for regulating the filament current and switches in the filament and plate circuits. Jacks are provided for checking the voltages supplied to the grids by the oscillating valves and the current sent out. The panels to the right and left of the amplifying valve are fitted with fuses for the different circuits, keys for the filament and plate circuits of the oscillating valves, a resistance for the filament circuit, and a reversing key for the measuring instruments. The right-hand key connects the voltmeter at the top of the section to the power leads; the left-hand key connects the ammeter, situated to the right of the voltmeter, in the filament circuits of the oscillating and amplifying valves. In principle this ammeter is also a voltmeter, as it measures the voltage at the terminals of the fixed resistances connected in the filament circuits; it is graduated in amperes. On the upper panel indicators are placed for automatically notifying any faults that may occur; they are in the form of apertures covered by a strip of ground glass behind which are placed small lamps which, when alight, indicate the failure of the voltage for the filament, plate, auxiliary grid, regulating grid, or telegraph. At the same time that the lamp glows, a bell also rings, thus giving both visual and audible signals for attention. Condensers and resistances are placed at the back of the panels for regulating the plate voltage.

The apparatus for the receiving end of a six-frequency set is shown in fig. 4. This section is also divided into six sets of panels similarly fitted with a receiving relay, regulating resistance for the filament current, a measuring instrument to control the current resulting from the reception of a train of waves, two lamp resistances for the relay contacts, detecting valve under a protecting cover, a switch for cutting off the current from the coils of the relay, and a jack for checking the current from the filter by means of a telephone or amplifying voltmeter. Beneath these panels are six other panels supporting the filters for the six frequencies. In the middle of the lower set of panels is placed the receiving amplifying valve and its reserve valve, which comes into operation automatically when necessary, a variable resistance for regulating the filament current of the receiving amplifying valve, three keys for the filament circuits and three keys for the plate circuits, as well as a jack for the control of the unamplified current. The spaces to the right and left are occupied, as on the sending section, with fuses, keys, and switches. The upper panel carries galvanometers for checking the outgoing currents to the Telegraph Offices, as well as the apparatus for verifying the power supply, and the fault indicators. The transformers, both ingoing and outgoing, of the receiving amplifying valve, and the detector transformers are placed at the back of the panel, as well as the regulating resistances and condensers of the power supply circuit.

The speed of signalling on the voice-frequency system is limited by the fact that the frequency band of the receiving filters is limited in width, which is a simple function of the duration of the transitory period of an alternating telegraph signal. Let us suppose that we can accept a duration of the transitory phenomenon equal to t seconds, then the narrowest band of transmission allowable will be given by the equation $\delta f = (0.8 \text{ to } 0.88)\ l/t$; but for greater security in practice we take $\delta f = 1.2\ l/t$. The filters in the system described have a transmission band of 80 periods, the transitory period being 0.015 second. A satisfactory service is possible when the transitory phenomenon is less than the duration of the minimum signal, known in the Morse code as a "dot." One can therefore send 67 dots (or dot spaces) a second, or 4,000 a minute, or 800 letters of the 5-unit code.

In practice it has been shown that on long-distance cables the transitory phenomenon has not prejudiced the security of service on lines exceeding a length of 1,000 kilometres. The transitory period of a signal is defined by the difference of the duration of propagation of the highest and lowest frequencies employed for the transmission of a signal. The band of frequency transmitted has a width of 80 periods. The difference of the duration of propagation is the highest for the band corresponding to the highest carrier frequency. This band is between about 1,600 and 1,680 periods. The duration of propagation of these frequencies on a conductor 0.9 millimetre in diameter and 1,000 kilometres long, is from 0.074 to 0.0763 second, giving a difference of 0.0023 second. As the receiving filters introduce a transitory period of 0.015 second, it is essential that the line should have not more than 0.005 second. This will be reached only by cables having a length of $(0.005 \times 1{,}000/0.0023) = 2{,}200$ km., about.

Static and Hurricanes.

Static, the bane of the radio fan, may prove a valuable warning of storms and hurricanes, according to a study made by the Hydrographic Office of the U.S. Navy. In a study of the value of weather maps in navigation, it was noticed that there was a very definite relation between the state of the atmosphere, as recorded in the data for weather maps broadcast from the naval radio station at Arlington, and static. Later, when the weather maps were broadcast and received by means of the machine invented by Mr. C. Francis Jenkins, wherewith a duplicate of the transmitted map is automatically drawn on the ship, it was found that the receiver could be used to record static. The Jenkins machine is used in connection with a radio compass: the latter is equipped with a loop antenna so that as the loop is rotated, and peals of static in any direction are detected by the receiver, corresponding ink lines are drawn on the paper-covered revolving drum of the Jenkins machine. In the time that it takes the recording pen to travel from one end of the drum to the other, the loop is turned through a complete circle, so that the paper gives a graphic picture of the static in any direction. Such hurricanes as the Miami one develop off Cape Verde several weeks before they hit the United States. It is suggested that a group of radio compass stations would be able to detect these storms as they approach. With three stations, where the lines cross would be the centre of the storm, so that its position could be accurately plotted and sufficient time for warnings and preparation could be allowed.—*Science Service.*

The "All-Earthed" House.

Some Suggestions for the Prevention of Shock from Domestic Electrical Appliances.

By H. W. CLOTHIER, M.I.E.E.

IT seems to me that some of the points in Mr. R. H. Rawll's interesting article on the earthing of portable domestic appliances in your issue of February 11th are so vital that they should be emphasised by further comment. One of the most important things that he says is that plugs and sockets with earthing arrangements embodied in them should be provided at every power point, and I agree very heartily with this as a principle. My own view of the best method of providing for earthing, however, is different from Mr. Rawll's: he advocates the use of three-pin plug sockets, and I find it better to have a metal-enclosed plug in which the outer case is used to make a scraping contact. My objection to the pin for earthing is that it may be damaged, and may therefore cease to make proper contact; in all my experience, on the other hand, I have never known a scraping contact to become unreliable.

In my own opinion, every piece of portable apparatus should be provided with a standard socket as an "inlet" for the current, from which the plug with its flexible cable may be detached. The plug at the other end of the flexible cable is, of course, also detachable from the socket on the wall. It may be called the "outlet," and thus the flexible cable, with the "outlet" plug at one end and the "inlet" plug at the other end, will be standard throughout the house, and may be used conveniently at any power point. Corresponding to the words "inlet" and "outlet" for the two ends, the word "trailet" has been applied by my company to the complete part consisting of the flexible cable and the two end fittings.

One of three possible conditions may obtain when the live conductor touches the frame of the apparatus. The frame may be properly earthed, the earth connection may be faulty, or the frame may not be earthed at all. The effect on a person who happens to be touching some other piece of earthed material will be different under each of these three conditions. In the first case, he may handle the frame of the electrical apparatus with perfect safety and no fear of discomfort; in the second, he will receive a shock, which will be more or less severe according to the amount of resistance in the earth connection; and in the third, he will receive a shock at the full voltage to earth of the supply system. A fatality occurring in domestic service is obviously a very serious matter, and, apart from that, it is also of the greatest importance to avoid all possibility of the frequent occurrence of even minor shocks. This is becoming more and more a subject for close attention, because the extent to which electricity will be used in the future is so much greater than it is now. If the present practice of not having effective earthing everywhere continues, it is certain that many more accidents will happen, and that there may even be fatalities; and it does not seem to me that this serious difficulty can be met by merely prohibiting the use of wall plugs in certain places. This would restrict the use of electricity quite unnecessarily. As Mr. Rawll points out, the things in a house that are earthed are not found only in bathrooms or sculleries; there may be, to name a few, kitcheners, used or disused gas pipes, cistern chains for flushing, wash-basin taps in cloak rooms and nowadays frequently in bedrooms, water radiators and pipes for central heating systems, bell wires, wires for connecting up wireless apparatus, and telephone earth wires. Modern buildings, too, have a great deal of steel work in their construction; one might go so far as to call some houses "metal-clad" as a whole. The network from which the domestic supply is taken is usually earthed on one pole outside the house; and when conductors connected to that pole happen to be in metallic contact with the framework, the latter will necessarily be at earth potential, and it is thus quite impossible to ensure that there will be no "earth," even in a room where the presence of earthed materials might not be suspected. I think we must also face the fact that the voltage may be as high as 260, and that this makes the problem more difficult in this country than in those where something in the neighbourhood of 100 V is used.

The bathroom is only different from other rooms because a person having a bath is likely to be in better contact with earth than in any other part of the house. A case is on record of a girl being electrocuted in a bath when using a hair dryer or vibrator; and it is at least conceivable that a person elsewhere who happened to be handling a piece of electrical apparatus—for example, a kettle with a faulty connection—might, if standing near a central-heating radiator, which would necessarily be earthed, put out a hand and touch the radiator, and thus run almost as great a risk in the drawing- or dining-room as in the bathroom. It seems to me that the obvious remedy is to adopt the practice employed in collieries and factories, that is, to earth the framework of all apparatus everywhere. In other words, it ought to be as unthinkable to have electrical apparatus with its framework unearthed in the house as it is now in industrial places. It may be argued that to provide for this would involve the introduction of a number of new regulations, but surely these regulations would be well warranted if absolute security were obtainable by working to them.

If universal earthing is adopted, the first thing to secure is continuity of the earthing system. This has been recognised already in other connections; for example, so long as 30 years ago concentric single-phase systems with earthed outers had only links, without switches or fuses, on the earthed side, and the prohibition by the I.E.E. Regulations of fuses or unlinked single-pole switches on the earthed side of an installation is well known. It has been argued in a discussion following a fatal accident due to a shock from a lamp-post, that there should be no fuses on the earthed side of any sub-circuit. In a discussion at one of the power conferences in Paris, an American engineer stated that the question of earthing had been considered in the United States, and that a proposal had been made to use a concentric system in which the outer was earthed and connected to the framework of the apparatus. At present, I believe, serious shocks are frequent in the States, notwithstanding the lower voltage commonly used there. There are a large number of washing machines, often in damp basements, and the earth connections of these are frequently much neglected or of poor quality. A bad earth connection is worse

than none at all, because it gives a false sense of security. In addition to this, two metallic parts of the earth circuit exposed in a house might have a difference of potential between them sufficient to cause arcing and possibly even a fire; and obviously a shock could be felt by a person touching both of these points, even though he was quite remote from the electrical apparatus. Effective bonding of the metal work in the earth circuit is therefore essential, and the best way of securing it is to use a bare copper wire leading from the sockets of the wall plugs to the nearest good "earth," such as a cold water pipe, and to clamp it to any cable cleating or other metal work that it may pass in its course. If the earth circuit is reasonably well made at the beginning, there is little fear that an open circuit will develop in it. A simple way of checking its continuity is to use the earthing conductor as a common return for the ordinary electric bell system of the house, coupling one terminal of the remote bell pushes to the end of the earth wire, and the corresponding pole of the battery to the nearest part of the cold water system. An accidental break in the earth wire would then be detected by the failure of the bell to ring, and, this indication having been given, the break could readily be found because the earth wire is on the surface and the connection to the water pipes is visible.

It is obviously essential for securing continuity in the earthing circuit that the connection between the earth wire in the flexible and the apparatus "inlets" and wall "outlets" should be thoroughly dependable. This can be achieved with certainty by the use of the protected plugs and sockets already referred to, in which a tongue in the socket or, alternatively, the entire circumference of the socket, makes a scraping contact all round the casing of the plug. Nothing short of deliberate intention, and the use of some special tool, could so distort this contact as to prevent it from making a proper connection. The earthing contact of the flexible is visible where it is connected to the terminals of the plugs at both ends, and, being locked by a spring washer, it cannot work loose unless it is purposely interfered with. One great advantage of this type is that a sound and permanent earth connection can be made by a wireman of ordinary skill. Another very important point is the making of a good earth connection between the protecting shield of the "inlet" socket on the apparatus and the framework of the apparatus. Sometimes a protrusion formed in the metal of the framework can be used, or the earth connection may simply be soldered or welded to the framework. Where this method is used, or a connection is made by bolts or screws, a thoroughly satisfactory job can be made of it at the maker's works, and the apparatus will be sent out in permanently sound condition.

The shrouded type of plug has the very important advantage that it can be used as a circuit breaker, because the arc, when the circuit is broken, is enclosed in a metal chamber. This being so, very considerable saving can be effected by using plug "outlets" without switches in house installations, or, alternatively, more plug "outlets" can be put in for the same total expenditure. It has been argued that if switches are not used, a meddlesome child may poke something into the socket. A switch at the door is, however, no protection in such a case. It would need to be near the socket, and interlocked with it; and it would certainly have to be a double-pole switch, not a single-pole switch like so many of those on the market, which give the impression of security without the reality, because there may still be a live pole although the switch is off. Even when a double-pole interlocked switch is used, the interlock must be essentially of good mechanism and such that it will not fail during the lifetime of the plug; it must clearly be close enough to prevent the plug from being partly pulled out so as to expose the pins when the switch is on. These requirements make the apparatus very costly if switches are included, and it is obvious that it is far from being as simple as when plugs and sockets are used of such sound construction that switches can be altogether dispensed with. The socket fitting can be recessed deeply into the insulation and the holes made so small that even the tiniest child would have difficulty in poking its fingers into the recess, and safety can thus be secured at least as certainly as with switches. A further useful precaution against danger to children crawling on the floor is to put the sockets out of their reach by fixing them two or three feet above the floor level, which gives a real advantage by actually making them more accessible in ordinary use.

I urge most strongly, finally, that it is right and proper to make our homes as free from discomfort and the possibility of danger as we make our factories, and I submit that this can be done in the way I have suggested without depriving ourselves of the use of electric portable appliances in any part of the house where we may wish to have them.

The Charges for Packages.

Returnable and Non-returnable Crates and Cases.

By W. ERIC JACKSON, LL.B., Barrister-at-Law.

THE question of packing charges is one which arises from time to time in every trade, very often leading to bad feeling, and more often than not to useless debits and credits being made. Strangely enough, there have been no authoritative legal decisions upon the question whether a seller can charge a buyer with the price of cases or crates, probably because most large sales of goods are in bulk, and in small sales the packing charges are negligible.

It seems to be a general principle of commercial practice which is recognised by the laws of France and of the United States, that all expenses prior to delivery are to be borne by the seller. This, of course, would include packing charges.

In this country, however, the expenses of delivery are generally borne by the buyer, subject, of course, to any contrary arrangement. The Sale of Goods Act provides that the question whether the seller must send the goods or whether the buyer must come and take them depends on the terms of the contract. If nothing is said, the place of delivery is the seller's premises; that is, the buyer must come and fetch the goods.

The Act, however, also says that "Unless otherwise agreed, the expenses of and incidental to putting the goods into a deliverable state must be borne by the seller." Hence, if the place of delivery is the seller's premises, the packing charges will be negligible in most cases. The goods need only be sufficiently packed so as to be handled by the buyer's carman.

If the goods are sold f.o.r. at the town where the

seller's business is, the goods must be packed sufficiently to enable them to go by rail. In this connection two decisions of the Courts are of interest. It has been held that where there was a sale of a cargo of rice "from the deck," the seller must pay all that is reasonably necessary for the buyer to remove the goods. Thus, harbour and dock dues were payable by the seller. And where wool was sold by weight, the seller was held liable to pay the cost of labour in putting the wool into the buyer's sacks.

If goods are sold on the terms that the seller is to send them per post or rail, the delivery is not complete until the goods have arrived. That is, the buyer will not be bound to pay for the goods if they arrive damaged or get lost in transit. Accordingly, the expense incidental to delivering them at the buyer's premises will fall on the seller. The fact that the buyer pays carriage charges sometimes confuses matters, and it might be argued that delivery in those instances is complete as soon as the goods are put on rail, the seller acting as agent for the buyer. But the trade practice is more often than not to the contrary, and if goods are lost in transit the loss is generally borne by the seller, who claims on the carrier. The fact, then, that carriage charges are borne by the buyer does not seem to alter the general presumption that in such contracts delivery is the buyer's premises.

Accordingly, packing material sufficient to protect the goods in transit is the seller's liability. This does not mean that he sells the package to the buyer. The sale is for goods, the package is only an incident in delivery. If the seller chooses to deliver by his own van, he need not pack the goods at all. The packing material is only the seller's means of making delivery, and the buyer cannot claim to keep it if the seller indicates his wish to have it back.

Accordingly, any statement on the invoice that the case is returnable, or any charge made for it, will be sufficient to tell the buyer that he must not keep the empty case. If he does, he will be liable to pay a reasonable price for it. What is a reasonable price depends on the circumstances, but generally the Court will accept the invoice price. If a buyer sees the charge made for a case and chooses to keep it, he will be deemed to have accepted the price charged. Where a case is returned, the seller must, of course, bear the carriage for its return.

A habit is creeping into existence in some trades of charging for packing material and stating that the package is not returnable. This, of course, leaves the buyer open to any number of abuses. The seller could charge top prices for cases and crates without the buyer being able to object. Such a state of affairs is unwarranted at law unless there has been some agreement between the parties previous to the sale. To send goods and state on the invoice, "Charge for case, so much; case not returnable," is not enough to render the buyer liable. By the time the invoice arrives, the goods may have been dispatched, and the buyer cannot but receive them. The invoice in such a case cannot be considered as an agreement.

But where the seller's quotation or price list states that cases will be charged for and will be non-returnable, the buyer will have to bear the cost of packing; for in ordering goods it will be assumed that he orders them on the terms stated in the price list.

But the seller will not be able to charge any price he likes. Suppliers cannot foist on to buyers old cases and make excessive profits out of them. The Sale of Goods Act distinctly says that where no price is agreed, the buyer must pay a reasonable price.

Shortly stated, the law seems to be, where the parties agree previous to the sale, that the buyer shall pay for packages, the seller may charge him a reasonable or an agreed price. Where there is no agreement to pay for packages, the seller must pay for them unless the place of delivery is the seller's place of business. The seller may make an invoice charge for returnable cases, and if the buyer keeps the case he must pay this charge. Otherwise he may return it at the seller's expense and be credited in full with the invoice charge.

A very recent case in Ireland confirms this view. In that case a firm of mineral water manufacturers sold their goods in bottles branded with their name. The course of dealing with customers was to invoice the bottles at a deposit rate of 2s. per dozen, and when bottles were returned they were credited in full. Where bottles were not returned the customers were debited. A dealer in mineral water ordered a hundred dozen bottles, and when 48 dozen of them were empty claimed to keep them at the price charged, namely, 2s. per dozen. This price was, in fact, only a bookkeeping charge, the bottles being much more expensive. The Court held that the dealer was not entitled to retain the bottles. The sale was a sale of mineral water, not of bottles, and the bottles throughout remained the seller's property. The buyer is only entitled to keep the bottles at the seller's agreed price, 2s. not being a reasonable or agreed price. This case contained circumstances which arose out of the course of dealing. In the ordinary way, if a seller makes a charge for a package, it will be assumed that that is the value he places on it; and the buyer can keep the package on payment of the price invoiced. In the Irish case it was stated on the invoice that the bottles could not be purchased, but remained the seller's. The case shows, however, that a sale of goods does not necessarily include a sale of the package, and that neither seller nor buyer can force the other against his will to buy or sell the packing material.

Legal.

British Thomson-Houston Co., Ltd., v. Mullard Radio Valve Co., Ltd.

Mr. Justice Tomlin, in the Chancery Division, on March 11th, had before him the motion by the British Thomson-Houston Co., Ltd., against the Mullard Radio Valve Co., Ltd., which had been adjourned from a fortnight ago. Mr. Whitehead, K.C., for the plaintiff company, said that the motion was for an injunction restraining alleged infringement of a patent. On the last occasion he mentioned that a settlement might be reached, and he was glad to say that the parties had actually come to terms which would involve the discontinuance of the action. He had advised his clients that the best course would be to take no order on the motion except that the costs would be costs in the action.

Mr. R. Moritz, K.C., for the defendant company, assented, and his Lordship made an order accordingly.

British Thomson-Houston Co., Ltd., v. Metropolitan-Vickers Electrical Co., Ltd.

In consequence of the indisposition of Lord Dunedin the further hearing in the House of Lords of this action could not be proceeded with on March 14th, and had to be postponed.

Triumph Trust, Ltd., v. Smith.

In the Mayor's and City of London Court, before Mr. Registrar Dell, on March 8th, a claim was made by the Triumph Trust, Ltd., Old Broad Street, E.C., against Mr. F. Smith, Keighley, electrical engineer, for £9 balance of payment for a radio set. The Registrar said that the defendant had sent a letter to the Court pleading fraud and misrepresentation. He stated that he had returned the set because of faulty equipment. The plaintiffs' solicitor said that the set had not yet been received by the plaintiffs. The defendant, in addition to his agreement with the plaintiffs to hire the set from them, was to get a commission of £1 if he got other people to take similar sets. A witness said that it was not true that the plaintiffs agreed to employ the defendant as sole agent in his neighbourhood. The Registrar said he was satisfied that the plaintiffs were entitled to recover. The plaintiffs' representative said the claim of £9 was for balance of hire; the value of the wireless equipment was £13, but the defendant, upon payment of the balance of the amount, would be entitled to it. Judgment was given for the plaintiffs for the amount claimed.

New Electrical Devices, Fittings and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A New Earthing Clip.

The accompanying illustration, fig. 1, shows a clip which has been introduced by Mr. G. TURNOCK, 41, High Street, Aston, Birmingham, to facilitate earthing connections on pipes and conduits. It is of the usual pull-up design, with clamping lugs served by a bolt and nut. The bottom portion of the clip is slotted and grooved internally. The earth wire is threaded through the slots, so that when the clip is tightened up the wire is pressed hard against the pipe. By means of the stamped-out portion for the internal groove, the contact is well protected. It is claimed that the grip obtainable is sufficient to carry the weight of an average man.

Improved Control Pillars.

An example of the range of control pillars developed by MESSRS. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow, S.E., is shown in figs. 2 and 3. The apparatus is particularly suitable for use in connection with underground haulages in collieries, several of which have standardised on the equipment for all their haulages. These pillars, which have recently been improved in several respects, can be supplied for controlling motors up to 120 h.p. at from 440 to 660 V. The distinctive feature of construction is, of course, the assembly of all the control gear for the motor in a single housing, thus eliminating the expense incurred in the supplying and fixing of interconnecting pipes and cables between independent pieces of equipment. The removal of the control pillar for periodical overhaul or repair is also a simple matter, and a spare pillar can be set down and connected up in a minimum of time.

Fig. 1.—An Earthing Clip.

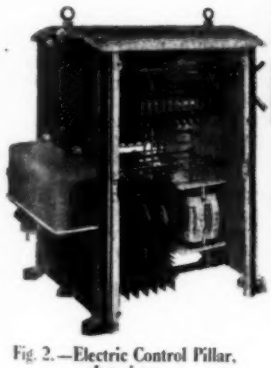


Fig. 2.—Electric Control Pillar, Interior.

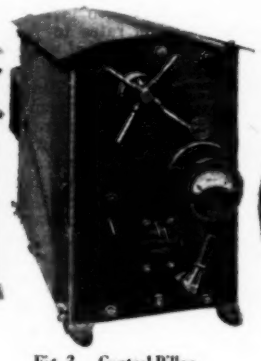


Fig. 3.—Control Pillar, Exterior.

For use with d.c. motors the makers' standard quick-break knife switch with an external operating handle is fitted, whilst for a.c. slip-ring motors a free-handle type of oil circuit breaker is supplied. Standard shielded-pattern fuses are employed for the d.c. equipment. The resistance is rigid, rustproof and unbreakable, the grids being pressed from a special resistance material, and adequately supported by mica insulation. Unless otherwise ordered, the resistances are supplied with a standard grid rating of two minutes over the first portion and continuously over the second portion for the smaller equipment, while for the larger pillars the grids are one minute, two minutes and continuously rated. The controller is liberally designed, the barrel contacts being of ¼-in. h.d. copper for all except the smallest size, in which 3/16-in. contacts are used for motors up to 20 h.p. A terminal box to take the incoming cable and motor leads is one of the improvements on the original design. A special operating gear having an "off" position catch to prevent the controller from being inadvertently carried through to the reverse position before the motor has stopped is supplied. Automatic air-break d.c. circuit breakers can also be fitted in place of switches and fuses for d.c. control pillars if required.

A New Street-Lighting Fitting.

The "White-Way" street-lighting fitting, fig. 6, is an example taken from a wide range of fittings specially designed for suburban use which has been introduced by the ENGINEERING & LIGHTING EQUIPMENT CO., LTD., Sphere Works, St. Albans, Herts. They are suitable for one 500-W lamp in the inverted position or for two lamps of 150, 200, or 300-W capacity in the ordinary position. The globe ring consists of a casting with a draining channel, and is provided with holes for accommodating the 5/16-in. brass screws by which a spun-copper retaining ring secures the globe at its neck. A centre supporting tube carries a small distribution box from which the lamp holders are suspended, and, by passing on to the canopy relieves the globe of all strain, it is claimed, due to high winds. The glassware is of the makers' "Lunax" quality, for which a lighting efficiency of 85 per cent. is claimed.

Two Special Automobile Lamps.

The leading lamp manufacturers have for some time past been experimenting to produce an automobile lamp which will eliminate glare and dazzle completely and avoid the necessity for dimming, dipping, or blacking-out, and it is interesting to learn that Messrs. PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2, have now placed on the market the "Duplo" lamp, fig. 4, by which, it is claimed, the object is efficiently achieved. This headlamp is gasfilled and provided with two filaments of equal lighting power; one furnishes a powerful light for normal use, and the second is fitted inside a metal cup which throws the rays toward the upper part of the reflector, whence they are reflected on to the road, thereby avoiding glare. As both filaments are of equal c.p., no reduction of light results from switching over from one to the other. The non-dazzling beam is also claimed to be of great assistance when driving in foggy weather. The lamp can be supplied for 6 to 7 V, 18 W (per filament), and 12 to 14 V, 36 W. Fig. 5 shows a twin-filament automobile headlamp which has been introduced by the British Thomson-Houston Co., Ltd., Rugby. This is also provided with two filaments of exactly the same wattage, one of which is situated at the focal point of the reflector, whilst the other is above this position. By means of a change-over switch the filament at the focal point is extinguished and the other lighted, giving the effect of a dipper. This lamp is provided with a corrugated glass bulb, which, it is claimed, eliminates all internal reflections, thereby reducing to a minimum all glare and dazzle. The Mazda lamp is supplied for working on 6-7 V, each filament having a loading of 18 W, and it is made with either English or American caps.

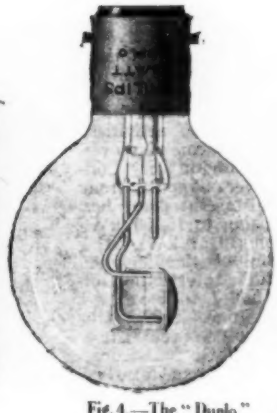


Fig. 4.—The "Duplo" Lamp.

Fig. 5.—"Mazda" Anti-dazzle Lamp.

Fig. 6.—"White-Way" Fitting.

Electrical Progress in New Zealand.

The Trade Commissioner's Report.

MR. L. B. BEALE, Trade Commissioner in the Dominion of New Zealand, has forwarded to the Department of Overseas Trade a report upon the economic and commercial conditions in the Dominion during 1924, 1925, and the first seven months of 1926.

After a period of prosperity, New Zealand received a slight check during 1924-25 and the succeeding year owing to unfavourable weather conditions which affected farming, and to a decline in wool prices. As a consequence, in the twelve months ended June, 1926, imports exceeded exports by about £6,000,000, whereas in the preceding year there was a balance of £6,500,000 in the opposite direction. The general economic position is, however, thoroughly sound, and any favourable movement of price levels will not only maintain but enhance the prosperity of the Dominion. The State finances are said to be in capable hands. During 1925-26, £7,180,479 was spent on public works, &c., of which £4,700,000 was expended on railways, telegraphs and telephones, and hydro-electric power schemes.

Industry and Trade.

Factory production in the Dominion is stated to be steadily growing. The total value of products increased from £76,996,397 in the year ended March 31st, 1924, to £84,101,313 in 1924-25. This figure includes the value of the output of many industries closely associated with primary production as well as those devoted to heat, light and power. Electricity generation and supply is credited with a value of £1,668,743, as compared with £1,430,951 in 1923-24. The value of engineering products is given as £1,846,218, as against £1,644,224 in 1923-24.

The total value of imports during 1925 was £52,456,407; with the exception of the "boom" year of 1923, when the figure reached £61,595,828, this is the highest recorded. New Zealand's imports of electrical goods and apparatus are not mentioned separately in the report, but we are told that Germany's share of this class of trade was £18,385 in 1925, as compared with £12,069 in 1924 and only £878 in 1923.

Hydro-Electric Development.

It is stated that £5,134,496 had been expended on hydro-electric works up to the date of the report, and the Minister for Public Works announced recently that the developments in view called for the expenditure of at least £1,000,000 a year for the next four years, after which there would be a reduction, but not a cessation, of constructional activities. The capital expenditure upon the Mangahao scheme was over £2,000,000 at the date of the report. Wellington City Corporation and a number of power boards were supplied from this source during the year, and the load on the plant has developed very rapidly, the peak load rising to 18,100 kW, very nearly the full capacity of the station (19,200 kW). The load factor is said to be good. In view of the demand, arrangements have been made to expedite the execution of the main Waikaremoana scheme. It is hoped to have two 20,000-kVA sets in operation there by June, 1929. The largest scheme—that at Arapuni—(96,000 h.p.) is progressing. The work, which is in the hands of Sir W. G. Armstrong, Whitworth & Co., Ltd., was originally intended to be completed in August next, and it is not expected that the time will be greatly exceeded. The duplication works intended to raise the capacity of the Lake Coleridge plant from 16,000 to 36,000 h.p. are nearing completion. The first of the new 7,500-kW sets was put into operation in July last and the second was well advanced. The finishing of these four schemes completes the Government's present programme, and the supply will be sufficient for some time. In the South Island, however, where the power is more limited, further investigations are being made with a view to the development of likely hydro-electric resources. The Government has adhered to its promise to use only British plant wherever possible, and only a small proportion of the requirements has been purchased from foreign countries. In January last year a licence was granted to a local group for the development of 50,000 h.p. in the vicinity of Deep Cove, Doubtful Inlet, for electrochemical purposes, as well as a further 250,000 h.p. from Lake Manapouri. The total cost of the whole scheme is estimated at £5,000,000. The first stage of the Lake Monowai scheme of the Southland Electric Power Board was completed and the power switched on on May 1st, 1925. The present capacity is 4,000 kW, and is to be extended to 12,000 kW.

Telephones, Telegraphs and Broadcasting.

The Post and Telegraph Department reported record business during 1925-26, and a satisfactory balance was earned. The rapid increase in the use of the telephone is striking; the number of subscribers' and other stations has doubled since 1917, the total now standing at 130,186 (94.4 per 1,000 of population). Some 30 per cent. of the subscribers are now provided for by automatic exchanges. The system was put into operation in Auckland in 1925, and later in the year the remaining manual exchanges were converted in Wellington. Christchurch is now partially equipped, and Dunedin will soon be totally automatic. In March last a telephone cable was laid between the North and South Islands. During the past two years capital expenditure upon telephones and telegraphs has approximated £1,000,000 per annum, and an extensive programme is in prospect.

Interest in radio-broadcasting was limited until, in August, 1925, the Post and Telegraph Department entered into an agreement with a company which undertook to provide an efficient service for five years. The company took over the existing services and opened a new 500-W station at Auckland. Similar stations were to be erected at Christchurch, Wellington, and Dunedin. At the date of the report the number of receiving licences issued was 5,000, but there were signs of an improvement; the number of dealers' licences doubled during the last year covered by the report.

Railway Electrification.

In August, 1925, two well-known London consulting engineers submitted to the Government a report dealing with the proposed electrification of the suburban sections of the railways in the vicinity of the four main centres. Its chief immediate interest lay in its suggestion that electrification of the existing Christchurch-Lyttleton line might meet present difficulties in a more satisfactory manner and at a lower cost than the construction of the projected new double-line tunnel. After consultation with local interests, a detailed scheme of electrification has been drawn up, and is at present under the consideration of the Government, with, it seems, good prospects of adoption.

Preference for British Goods.

On April 1st, 1926, new regulations were brought into force which limited in general the application of the British preferential tariff rates to goods of the works cost of which half at least consists of British Empire material or labour or both, and which have undergone the final process of manufacture within the Empire. Goods not included within this heading nevertheless enjoy the benefits of preference if all processes of manufacture have been performed within the Empire from unmanufactured raw materials, or from certain specified partly manufactured raw materials. Broadly speaking, the effect of the new regulation has been to raise from 25 per cent. to 50 per cent. the proportion of British labour or material, or both, necessary to qualify for preference. The object in view has been to prevent manufactures of foreign origin qualifying by reason of final processes of finishing off or assembly carried out within the Empire, and thus to encourage the importation of goods thoroughly British in character. Whilst to a considerable extent this aim appears to have been achieved, the result has been in certain lines to divert a proportion of the trade to foreign sources of supply.

American Activity in Brazil.

The semi-official *Industrie und Handels Zeitung*, of Berlin, in announcing the sale to the General Electric Company by the "Cia. Brasileira de Energia Elettrica" of its power stations in the States of Rio de Janeiro and Bahia, expresses regret that by this sale the prospect of German industry participating in the contract for the extension of the Bananeiras power station has diminished. The purchase price is said to be 72,000 contôs (say £1,800,000) for the Rio de Janeiro works and 22,000 contôs (say £550,000) for those in Bahia. The transfer was to take place in about two months, the working staff to be retained, but the supervisors to be replaced by Americans. The Rio newspapers attributed this acquisition by the Americans to the desire to obtain control of fresh outlets for their products. It is recalled that the General Electric Co. has already bought the Cia. de Tramways, Luz e Forca, of Victoria, as well as the Expresa Paulista de Electricidade, of Pauru, and that it is also in negotiation with the Orion Company, of Barretos, which owns the Mariabondos falls in the Paulista district.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Private Bills.

The Bognor Gas and Electricity Bill has been read a second time in the House of Lords. The North Metropolitan Electric Power Supply Bill has been read a first time in the House of Commons.

A Fatal Explosion.

On March 8th, Mr. DAY asked the Minister of Transport whether his attention had been drawn to the evidence given at the coroner's inquest on a woman who received fatal injuries in an explosion at her home, due to the fact that an electric feeder laid down along the road by the District Council was over 25 years old and encased in bitumen, and was burnt away for about 18 in.; and if he could state whether a periodical system of overhauling was carried out, in accordance with the requirements of the Ministry.

Colonel ASHLEY said that the Electricity Commissioners had been informed by the electricity supply company concerned that a gas explosion was the cause of the damage to the cables, and that the cable where the accident took place was in no way connected to the adjacent mains encased in bitumen, which were situated on the opposite side of the street.

Broadcasting.

On March 8th, the Postmaster-General, replying to questions, said that the number of broadcast receiving licences issued during the year 1926 was 2,178,000, as compared with 1,642,000 in 1925. The total receipts amounted to £1,089,000 and £821,000 respectively. Experimental wireless licences had been issued to several persons to enable them to undertake experimental work in the direction of the broadcasting of both still and moving pictures. Several systems had been suggested, but the matter was not yet out of the experimental stage.

Transatlantic Telephony.

On March 8th, Sir W. MITCHELL-THOMSON informed Captain Crookshank that for the period January 7th-31st, the running costs of the British end of the Trans-Atlantic telephone service, including sundry expenses incidental to the initiation of the service, amounted to approximately £2,000, and plant charges—depreciation and interest—to a further £1,900. It was expected that the service would be self-supporting.

Call Boxes in Post Offices.

On March 8th, Capt. CROOKSHANK asked the Postmaster-General whether he could form any estimate of what would be the cost of installing a public telephone call box in every post office in this country.

Sir W. MITCHELL-THOMSON said that no reliable figure could be given without compiling an estimate for each individual office, but the total would probably be not less than £2,000,000.

Rural Telephones.

On March 8th, replying to Mr. Rhys, Sir W. MITCHELL-THOMSON said that the number of new rural exchanges authorised during the years 1924, 1925, and 1926, was 211, 191, and 141 respectively.

Compasses for the Fleet.

On March 9th, Sir HARRY BRITTAIN asked the First Lord of the Admiralty if he was aware that all the gyro-compasses in the Fleet were of foreign origin; that the essential gyroscopical units were made abroad; that instructions to officers at the compass observatory and in the Admiralty manual were limited to this particular apparatus; and would he have inquiries made into the matter.

Lieut.-Colonel HEADLAM, who replied, said that the standard gyro compass used in the Fleet was the Sperry type (American). At the end of 1913, as a result of competitive trial, it was decided to adopt this type instead of the Anschutz (German), the only other gyro-compass then on the market. From that time until the end of the war, as a result of the above decision, the Sperry Company of Brooklyn supplied the British Fleet with gyro-compasses. The scrapping policy after the armistice released a large number of those compasses; they had been reconditioned, and used for further service. As this was the only type of compass in use in the Navy no object was seen in describing other types in the Admiralty manual. When it again became necessary for the Admiralty to purchase any considerable number of gyro-compasses it would afford an opportunity to firms to submit instruments for competitive tests at sea. The foreign-owned organisation (The British Sperry Company) employed British labour and material, and compasses manufactured for the Navy were now made in this country. A further trial of a gyro-compass made by a British-owned firm would shortly be instituted.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Campaign Notes, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

Our Trade Names Supplement.

Accompanying this issue of the ELECTRICAL REVIEW we are circulating the fourth of our quarterly Trade Names Supplements.

The E.D.A.-E.L.M.A. Campaign.

The official report for the week ended March 12th says that during the week demonstration electric houses were opened at Durham, Sunderland, Blyth, South Shields, Halifax, and Peterborough, and that further houses were to be opened shortly in the following districts:—Halifax, Birmingham, Stoke-on-Trent (2), Derby, Tamworth, Whitley Bay, Whickham, Saltburn, Darlington, West Hartlepool, Annfield Plain, and Newcastle. The Carlisle house was kept open until March 12th, and up to the time of the report had been visited by 10 per cent. of the population. An average of 1,000 people a day were attending the Minard Road (Glasgow) house; coloured lighting was used freely in the rooms of this house. The average daily attendance at Chesterfield is 500, and contractors are said to be delighted with the results. During the first six days about 3,000 people inspected the Leicester house; 80 per cent. of the inquiries related to water heating. The exhibition at Dumfries is reported to have been a success from the business point of view. An electrical exhibition is being run at Yarmouth by the local circle, and an essay competition for boys and girls has been arranged. The North-East Coast children's painting competition was successful.

In last week's official report the attendance at the Aberdeen house during the first nine days was given as 899. This should have been 8,999—a somewhat larger figure!

In our last issue we reported the opening of an all-electric house at Sunderland. We have now received from the

The Sunderland Demonstration House.

Borough Electricity Department samples of literature distributed at the house and photographs, one of which is repro-

duced herewith. One brochure treats of the advantages of the electric home and is well illustrated, and there are pamphlets dealing with the Corporation's appliance-hiring schemes, hire-purchase wiring scheme, and continuous hiring arrangements. Sunderland has an attractive two-part charge for domestic consumers.

A further mass meeting of supply engineers and chairmen of electricity committees was held on March 11th at the Lighting Service Bureau, Manchester. Mr. P. P. Wheelwright, of Blackburn, was in the chair, and Mr. W. E. Bush was the principal speaker. The meeting was chiefly concerned with ways and means of distributing further competition booklets. It was decided to order another 20,000 from E.D.A., and various members of the audience promised to assist in the distribution of large numbers. Mr. Bush stated that up to March 7th 50,000 ballot papers had been received, and that they were coming in at the rate of 1,500 per day. This compared with 40,000 from another somewhat similar competition run by a popular paper.

E.D.A. Annual Meeting.

The annual meeting of the British Electrical Development Association was held at the Savoy Hotel yesterday (Thursday) afternoon. The annual dinner took place at night.

Humour in Advertising.

The British Thomson-Houston Co., Ltd., has sent us a copy of the "Rag Rag," a magazine produced by Manchester University students for their Hospital Week. The contents are refreshing, and the advertising section is most amusing. The B.T.-H. advertisement claims that Mazda daylight lamps "enable you to see as well in Manchester by day as by night." An announcement relating to Ferranti l.f. transformers reproduces the company's well-known musical scale, and says "Learn to play this at sight by the Ferranti method without hours of arduous practice." The advertisement of the Chloride Electrical Storage Co., Ltd., is headed "Many an Oxide makes an Exide."

Great Britain's Radio Exports.

The *Wireless Trader* publishes details of the exportation of radio apparatus from this country during January. The total value of the goods (including valves, £11,532) was £88,765. The three most important customers were Japan (£14,684), Australia (£12,980), and Russia (£11,123).

Electric Power in Industry.

The second preliminary report upon the third Census of Production deals with the cotton, and other industries. It was issued as a supplement to the *Board of Trade Journal* for March 3rd. The increased use of electrical power in the cotton trade since 1907 is shown by the following statement, in which particulars of the capacity of electric generators in cotton mills in the two years are given:—

Electric generators. Driven by	1924. KW.	1907. KW.
Steam engines, reciprocating ...	80,092	28,906
Steam turbines	25,545	2,681
Other power	3,875	487
Total	109,512	32,074

The total horse-power of electric motors driven by electricity generated in cotton factories was returned as 128,506. In addition, electric motors of a total horse-power of 176,959 were included in returns received for the year 1924 as driven by purchased electricity. Of this aggregate, 12,299 h.p., or about 7.0 per cent., was "in reserve or idle." Similar particulars were not obtained for 1907.

In the boot and shoe trades, in 1924, there were 3,401 h.p. of electric motors supplied by electricity generated at the factories themselves, while 32,519 h.p. of motors were supplied from outside sources.

The rubber industry returns for 1924 showed that 36,747 h.p. of motors were driven by factory-generated power and 56,238 h.p. by purchased power.

In 1907 the paint and varnish trades had an aggregate of 512 kW generating power; the figure for 1924 was 3,006 kW. Of the 36,431 h.p. of electric motors in use in 1924, 23,568 h.p. of them derived their energy from outside sources.

The supplement to the *Journal* for March 10th shows that in the grain-milling trades electric motors aggregating 68,521 h.p. were installed in 1924; of these a total of 13,437 h.p. were driven by electricity generated in the mills. In the sugar and glucose trades the total capacity of installed generating plant in 1924 was 18,004 kW, as compared with 4,205 kW in 1907; the aggregate power of electric motors was 33,883 h.p., of which 30,394 h.p. was supplied by the industries' own generating plant. The spirit distilling trade in 1924 had generating plant amounting to 5,041 kW (as compared with 503 kW in 1907) and the total h.p. of electric motors installed was 9,128 h.p. (3,022 h.p. purchased). The spirit compounding, &c., trade only had 351 h.p. of electric motors installed, and the tobacco trade had 11,764 h.p., energy for 9,485 h.p. of this being purchased.

Commercial Electrical Travellers.

The Electrical Trades Commercial Travellers' Association is holding a carnival dance to-night (Friday) at Victory House, Leicester Square, W.C.2.

The Power Efficiency Exhibition.

As we have already reported, a Power Efficiency Exhibition is to be held in Manchester from June 22nd to July 2nd. This, for the first time, will cover in one specialised trade exhibition the whole field of steam and power generation, transmission and utilisation. One of the most important sections will be steam generation. Here there will be boilers of all types,, boiler fittings, coal crushers, coal- and ash-handling plant, economisers, feed-water heaters, mechanical stokers, soot blowers, pulverised fuel plant, weighing equipment, &c. Attention will be given to gas firing, low-temperature carbonisation, and the transmission of power. An important series of conferences, &c., is to be held during the exhibition. The manager of the exhibition is Mr. F. Nasmith, 121, Deansgate, Manchester.

Trade Announcements.

Messrs. E. Brook, Ltd., Empress Works, Huddersfield.—The name of the above firm has been changed to Brook Motors, Ltd. No change has been made in the personnel or management.

Messrs. E. Mercer, Ltd., radio engineers, Castleford, have opened additional premises at 36, Carlton Street, in that town.

Messrs. Young, Osmond & Young, Ltd., have removed to Excelsior Works, The Broadway, Bexley Heath, Kent. Telephone: Bexley Heath, 519.

New Catalogues and Lists.

Messrs. L. McMichael, Ltd., Wexham Road, Slough, Bucks.—Monthly circular to the trade, with a blotter and pamphlet advertising the company's multiple switch and h.f. transformers.

The Rees Roturbo Manufacturing Co., Ltd., Wolverhampton.—Circular R238, illustrating and describing the company's engine-driven pumping sets for agricultural and other purposes.

Messrs. F. Gilman (B.S.T.), Ltd., Regent Street, Smethwick.—A descriptive catalogue of "Skatoscalo" boiler-scaling and rust-removing tools.

Metro-Vick Supplies, Ltd., Trafford Park, Manchester.—Illustrated and priced pamphlets dealing with the "Litlux" bed light and the "Cadillac" vacuum cleaner; and a mailing card fully describing the "Emvee" lampholder.

The Universal Manufacturing Co., 3, The Grove, Blackheath, S.E.10.—A price list of electric lamps and a card bearing samples of coloured enamels—opaque and transparent.

The Foster Engineering Co., Ltd., Morden Works, Wimbledon, S.W.19.—A brochure illustrating and describing the company's outdoor sub-stations.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1.—March stock list of dynamos and motors.

Messrs. Gent & Co., Ltd., Faraday Works, Leicester.—Book 4, describing, with illustrations, electric watchman's or "tell-tale" clocks. Priced.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.—Leaflet No. 80, giving details and prices of "Philips" h.t. supply units for a.c. or d.c.

The Yorkshire Electric Transformer Co., Ltd., Dewsbury.—An illustrated leaflet advertising transformers for rural distribution.

Priorsells, Ltd., 110, Cannon Street, E.C.4.—A priced booklet and a series of pamphlets illustrating and describing the company's ultra-sensitive selenium cells for numerous applications.

The Grout Engraving Co., Ltd., 7, Bridewell Place, E.C.—Two illustrated booklets dealing with the company's work and containing examples.

The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—Leaflet No. X4355, illustrating and describing switches for service in theatres, &c. Priced.

The Hart Accumulator Co., Ltd., Stratford, E.15.—A list of distinguished users of "Hart" batteries.

Siemens & English Electric Lamp Co., Ltd., 38-39, Upper Thames Street, E.C.4.—Catalogue No. 160, dealing very fully with the "Siemens-Xcel" domestic electrical appliances, ranging from large cookers to irons. Priced and illustrated. Notes on running costs are included.

The Electric Furnace Co., Ltd., 17, Victoria Street, S.W.1.—Pamphlet D.2, describing the company's electric resistance furnaces. Illustrated.

The Mullard Wireless Service Co., Ltd., 21, Denmark Street, W.C.2.—A comprehensive catalogue of the company's valves, containing illustrations, details and prices of about 50 types—transmitting, detecting, amplifying, and modulating.

The Westinghouse Electric & Manufacturing Co., East Pittsburg, Pa., U.S.A.—Illustrated pamphlets, dealing with a vest-pocket ammeter and a cabinet portable voltmeter for radio purposes.

Messrs. Baxter & Caunter, Ltd., 219, Tottenham Court Road, W.1.—March price list of electrical materials, appliances, and accessories. Fully illustrated.

The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, W.C.2.—Two coloured posters, one dealing with a three-valve receiver employing "K.L.1" and "U.5" valves, and the other advertising the "Marconiphone" h.t. supply unit. Also a window slip advertising "Marconi" valves.

The Bastian Meter Co., Ltd., 58, Haymarket, S.W.1.—An illustrated and priced pamphlet, giving particulars of "Bastian" storage geysers.

Messrs. Hans Renold, Ltd., Burnage Works, Didsbury, Manchester.—An illustrated catalogue of "Renold" chains, &c.

BROCK MOTORS, LTD., Empress Works, Huddersfield.—An illustrated catalogue of single-, two-, and three-phase motors, squirrel-cage and slip-ring types.

THE LONDON ELECTRICAL CO., 1, Sherborne Lane, King William Street, E.C.4.—A well-illustrated, priced catalogue of radio receiving sets, components, and accessories.

Bankruptcy Proceedings.

A. J. GARROD, manufacturer of valves, sets, and parts used in wireless telegraphy, Whitehorse Place, Wellingborough.—Receiving order made March 4th, on creditor's petition. First meeting, March 21st, at the Official Receiver's office, The Parade, Northampton. Public examination, April 1st, The County Hall, Northampton.

O. WALKER (Albion Electric Co.), electrical contractor, 112, Albion Street, Wallasey.—First meeting, March 21st, at the offices of the Official Receiver, 11, Dale Street, Liverpool. Public examination, April 6th, at the Court House, Birkenhead.

Company Liquidations.

SELLING WIRELESS, LTD.—A meeting of members is called for April 12th, at the office of Messrs. Lee & Whitfield, Bank of Liverpool Chambers, Park Row, Leeds, to hear an account of the winding up from the Liquidator, Mr. J. A. Couper.

WIRELESS VALVES, LTD.—A meeting of members is called for April 20th, at the offices of Messrs. Blakemore, Elgar and Co., 9, King's Bench Walk, E.C.4., to hear an account of the winding up from the Liquidator, Mr. G. Freire-Marreco.

BRITISH WIRELESS SUPPLY CO., LTD.—First and final dividend on preferential claims of 8s. 4½d. in the £, payable at 12, Northgate, Bradford.

FOOLPROFE PATENT ACCUMULATOR CO., LTD.—Winding up voluntarily. Liquidator, Mr. G. T. Berry, 32, The Square, Market Harborough. Meeting of creditors, March 25th, at 44, High Street, Market Harborough. Particulars of claims to the Liquidator by April 9th.

KNIVETOWN ELECTRIC WIRE CO., LTD.—Particulars of claims by April 16th, to the Liquidator, Mr. S. W. Tubbs, 24, Basinghall Street, E.C.

WOODSTOCK ELECTRIC LIGHT CO., LTD.—A meeting of members is called for April 4th, at the Town Hall, Woodstock, to hear an account of the winding up from the Liquidator, Mr. V. N. Tolley.

Dissolution of Partnership.

PARKINSON & TALBOT, plumbers, electricians, &c., Clayton West, near Huddersfield.—Messrs. W. A. Parkinson and J. E. Talbot have dissolved partnership.

Private Arrangements.

R. D. TREVOR ROPER, 6a, St. Leonards Road, Bexhill-on-Sea, electrical and radio engineer.—A meeting of creditors was held at the offices of Messrs. Poppleton, Appleby & Hawkins, 4, Charterhouse Square, E.C., on March 9th, when Mr. E. H. Hawkins said that the debtor commenced trading on his own account four years ago as an electrical and wireless dealer. Later, he removed to premises in St. Leonards Road, and also took over a shop at another address. Last October the debtor required further capital and it was arranged that £200 should be put up provided a limited company was formed. A limited company was formed on October 20th last, and the purchase price which the company paid was £1,205, which was satisfied by fully-paid shares. The nominal capital of the company was £2,000, and shares were issued to the extent of £1,407. Instead of the debtor keeping the shares for himself he only took over 500, and the remainder were issued to his nominees, principally for cash advanced to the debtor before the limited company was formed. The debtor's own personal debts amounted to £615, and there were costs and other charges. The debtor had intimated to Mr. Hawkins that he understood that the limited company would discharge his liabilities, but Mr. Hawkins had gone into the matter, and so far as he could see there was no legal claim on the company. The debtor had been sued by several creditors, one of whom had issued a bankruptcy notice. The debtor had intimated to the creditors that he was prepared to offer a cash composition of 5s. in the £ in settlement of their debts. Several of the creditors had written to say that they were prepared to accept the offer, including the petitioning creditor. The creditors present recommended the acceptance of the debtor's offer, and it was decided that the suing creditors' costs should be paid in full.

E. W. DICKIE, trading as E. W. Dickie & Co., 13, The Broadway, Gleneagle Road, Streatham, S.W., electrical and radio engineer.—A meeting of creditors was held recently at the offices of Messrs. Veitch & Co., C.A., 9, Coleman Street, E.C., when Mr. H. J. Veitch presented a statement of affairs which showed liabilities of £1,469 and net assets of £554, leaving a deficiency of £915. There was also a lease of unascertained value. According to the trading figures presented for the two years ended December 31st, 1920, the sales were £6,210, there was a gross profit of £1,289, the expenses were £847, and there was a net profit of £442. The drawings were £522. For the year ended December 31st, 1921, the sales were £3,453, on which a gross profit was made of £1,014. There was a net profit of £396, and the debtor drew £402. During the following year there was a profit of £57 on sales of £2,505, while for the year ended December 31st, 1923, the profit was £374 on sales of £3,139. During the following year the sales were £2,535, there was a gross profit of £688, and a net profit of £126. During that period the debtor drew £283. For the following twelve months the sales were £2,425, there was a gross profit of £814, and the net profit was £256. The debtor drew £286. From January 1st, 1926, to March 8th, 1927, the sales were £2,039, the gross profit was £549, and there was a net loss of £36. The debtor drew £247. It was decided that the estate should be dealt with under a deed of assignment in favour of Mr. H. J. Veitch and Mr. A. J. Osborne, of Balfour House, Finsbury Pavement, E.C., as joint trustees, together with a committee of inspection consisting of the representatives of the Hart Accumulator Co., Ltd., Edison Swan Electric Co., Ltd., and Mr. P. S. Booth, representing creditors.

J. A. SMITH and C. H. MALLEY, trading as the Boro' Electric Co., 457, Borough Road, Birkenhead, electricians.—A meeting of creditors was held recently, at the offices of Mr. C. Semper, Liverpool, when a statement of affairs was presented which disclosed liabilities of £743, and assets of £130, leaving a deficiency of £613. The business was established on February 1st, 1923, with a capital of £200, found by Malley. Of that amount £100 was his own money, and £100 was lent to him by his father. The sum of £120 was expended in fitting up and decorating the shop. A full set of books had not been kept, but it was estimated that during the year ended January 31st, 1924, the turnover was £1,500, and in the following twelve months it increased to £1,700. During the year to January 31st, 1926, the turnover was about £2,000, and during the following year it was about the same amount. On February 4th the landlord distrained for rent, and a distraint for rates was also levied. The stock, which was estimated by the debtors to have cost £150, was removed for sale, and the debtors believed that it realised rather more than £50. The present position was attributed to losses on contracts and lack of capital. No definite offer was submitted, and no resolution was passed. The creditors include:—

	£		£
Advance Lamp Co. ...	153	Karpax, Ltd.	20
Henry & Paris, Ltd. ...	31	General Electric Co., Ltd.	202

H. A. RATCLIFFE, trading as United Agencies (Western), electrical and wireless dealer, 15, Charles Street, Cardiff.—A meeting of creditors was held on March 7th, at the offices of Messrs. Phœnix & Levinson, Cardiff, when the representative of Messrs. Siemens Bros. & Co., Ltd., one of the principal creditors, was elected to the chair. The statement of affairs presented showed liabilities of £7,208 and net assets of £1,622, leaving a deficiency of £5,586. The debtor commenced trading on June 1st, 1925. Prior to that date he was the local manager for a well-known firm in the trade. The debtor commenced with about £500 in cash, received from his father, who guaranteed the bank to the extent of £2,000. It was also understood that the father had guaranteed certain of the creditors' claims. During the past few months the debtor had been in ill-health. He was recently pressed by creditors, and on March 2nd executed a deed of assignment to Mr. Holbrook. There was a total loss of £6,086, accounted for by a loss on trading, bad and doubtful debts, written-off stock, depreciation, and personal expenditure. The turnover since the commencement had been £11,871. A resolution was passed confirming the deed of assignment already executed to Mr. Holbrook, and it was also decided that the debtor should be given seven days in which to find cash for the payment of a composition of 5s. in the £, failing which the estate should be realised under the deed, under the supervision of a committee consisting of the representatives of Messrs. Siemens Bros. & Co., Ltd., Poppleton & Appleby, Birmingham, and Clarke, Dovey & Co., Cardiff. The following are creditors:—

	£		£
Belling & Co.	42	Marconiphone Co., Ltd.	195
Benjamin Electric, Ltd.	25	Nathan, Frank J., & Co.	34
British Thomson-Houston Co., Ltd.	24	Oldham & Son, Ltd. ...	32
Chloride Electrical Storage Co., Ltd.	67	Philips Lamps, Ltd. ...	61
Ferranti, Ltd.	67	Radio Instruments, Ltd.	25
Graham Amplion, Ltd....	50	Shanks & Co., Ltd. ...	22
General Electric Co., Ltd.	771	Siemens Bros. & Co., Ltd.	275
Hardwicke, C. J.	21	Wolff, M. & A.	39
		"Z" Electric Lamps and Supplies Co., Ltd.	117

Deed of Assignment.

J. L. COUBTER, electrical engineer, 181, Perth Road, Dundee.—Particulars of claims by March 21st, to the Trustee, Mr. P. J. McIntyre, 20, Reform Street, Dundee.

New Municipal Showrooms and Offices.

The Fulham Electricity and Lighting Committee has recommended that premises in Fulham Road be demolished and that new showrooms and offices be erected on the site at an estimated cost of £13,000.

At a meeting of the Nottingham Society of Engineers, on March 7th, strong opposition was raised to the projected establishment in Nottingham of a municipal showroom for electrical appliances, it being argued that if such an arrangement were made it would result eventually in the local supply undertaking losing the salesmanship of an enterprising body

of contractors. Mr. G. S. Haydon, resident engineer at the North Wilford power station, contended, however, that such a showroom would be a valuable asset in educating the public. It need not sell directly at all, but might refer inquirers to firms of contractors.

For Sale.

Mr. G. R. Lightfoot will sell by auction, on March 31st and following days, at 13, High Holborn, W.C., wireless and electrical trade stocks. By order of the D.A.D.O.S., Messrs. Horne & Co. will sell by auction, on April 5th, at Hilsea Lines Ordnance Depôt, Cosham, Portsmouth, electrical plant, cable, hand and machine tools, &c. By direction of the trustees, under a deed of assignment, Messrs. Trubshaw and Taylor will sell by auction, on March 30th and 31st, at 3 & 5, Mansell Street, Aldgate, E., the stock of an electric, gas and water fittings manufacturer, &c. (See our advertisement pages to-day.)

Social Events.

The Hackbridge Cable Company's Sports Club is holding its annual dinner at the Grey Hound Hotel, Carshalton, on Saturday, April 9th.

On February 25th the staff of the London Electric Wire Co. & Smiths, Ltd., held their annual ball at the Hotel Metropole, over 150 members of the staff and their friends being present. The gathering was representative of the board, the London office, the Leyton works, and the provincial branches.

The electrical staffs of the Doncaster Collieries Association, Ltd., held their second annual dinner and dance recently. Mr. C. C. Bleack, electrical engineer to the company, mentioned, in replying to a toast, that the amount of energy generated by the associated companies had risen from 16,250,000 kWh in 1922 to 27,330,000 kWh in 1925. Last year it fell to 21,500,000 kWh; had it not been for the coal stoppage it would have been something like 33 million kWh. Representatives of many of the leading electrical companies were present at the dinner.

The Electricity Supply Commercial Association (Greater London Division) is holding a dance on Saturday evening, March 26th, at the Poland Rehearsal Rooms, 49, Poland Street, W.1. Tickets can be obtained from delegates and the divisional and general secretaries.

The annual staff dinner of the Sterling Telephone and Electric Co., Ltd., was held at the Abercorn Rooms on March 4th, and was, as usual, well attended. The chair was taken by Mr. W. H. Peak, O.B.E., managing director, supported by Mr. C. E. Hunter, works manager, and Mr. N. Blades, chief telephone engineer. An excellent musical programme, provided by members of the staff, completed a very enjoyable evening.

Unemployment.

The Employment Exchange returns show that the number of unemployed continues to fall. On February 28th the total was 1,169,500, as compared with 1,196,060 on February 21st, and 1,107,140 on March 1st, 1926. The increase, as compared with last year, is due to the fact that there are 97,000 fewer men employed in the coal-mining industry; in most other branches conditions are better.

The Peruvian Market.

Mr. J. P. Trant, British Consul at Callao, has recently forwarded to the Department of Overseas Trade a report (dated October, 1926), upon the commercial, economic, and financial conditions in Peru. The general impression gained from Mr. Trant's introduction is that Peru is a settled country and has made considerable progress in the direction of important public works. Unfortunately, this policy of improvement has proceeded too rapidly, with the result that the public debt has increased to an abnormal extent, with a corresponding rise in taxation, which has affected industry badly. The mining industry, which is mainly under foreign control, maintained its position during 1925, when the production of copper rose in value from £P2,406,031 to £P2,829,666, and that of lead from £P37,171 to £P191,693. The statistics of foreign trade during the first six months of 1926 give the value of imported electrical goods as £179,714. In 1925, the value was £372,781. It is stated that the charges for electricity in the capital, Lima, are high, and restrict its use to lighting in the domestic sphere, and to the occasional pumping of water. There is consequently no market for cooking and heating apparatus. The demand for crude-oil engines for generating electricity, on the contrary, has been stimulated. Industrial development has been retarded by the high cost of power. Interest in broadcasting is stated to be languishing on account of the difficulties of providing suitable entertainment and picking up distant stations owing to atmospherics. The post and telegraph services have been taken over by Marconi's Wireless Telegraph Co. Ltd., for a period of 25 years. There are a number of small public telephone companies operating in Peru, but the Marconi Co. has secured preference in opening up new districts. In the Peruvian market keen American competition is encountered; conditions are all in favour of the United States. The appointment of local agents is advised rather than the sending of travellers, whose way is not made easy. The need for Spanish in communication is stressed.

The Basle Fair.

Details of this year's Swiss Industries Fair which will be held at Basle from April 2nd to April 12th, are now available. The new permanent fair buildings, which have been under construction during the past three years at a cost of ten million Swiss francs are now completed. They comprise, in addition to the six exhibition halls, a series of social and business rooms for the convenience of buyers, including private offices in which current business may be conducted. Special fare reductions will be granted to visitors to the Fair by the Swiss Federal Railways. An illustrated brochure has been issued by the fair authorities, and is obtainable from them or from the Swiss Legation in London.

Gift to Bradford Technical College.

Messrs. Jessop & Boydell, Ltd., electrical engineers and contractors, of Bradford, have made a gift of electrical instruments and resistances to the Electrical Engineering Department of the Bradford Municipal Technical College, and have received the thanks of the Technical Education Sub-Committee.

"Hand-to-Mouth" Buying.

A symposium of American views upon this subject, which is of great importance to manufacturers, is reproduced in the January *Journal* of the British Empire Chamber of Commerce in the United States. Generally speaking, the manufacturers condemn the practice of buying for immediate needs only; one of them states that it increases overhead charges to a great extent. Others realise that the improvement of transportation facilities has made the practice feasible for the retailer, and that view is put with some force by the president of the Pennsylvania Railroad (Mr. W. W. Atterbury). He says that the confused ideas upon the subject give the phrase "hand-to-mouth buying" an odium which is unreasonable.

"Forward buying in the sense that term was used years ago is no longer necessary or, in my opinion, desirable. There are several reasons for this: The transportation services now available eliminate risk that goods or supplies will not be on hand when wanted; piling up inventories is, industry has found, an undesirable practice; forward buying accentuates seasonal activity with corresponding slumps in employment; buying on an as-required basis spreads our production more evenly; and the tendency towards changes in design and requirements makes it undesirable to stock great quantities."

The *Journal*, while it can discern no effect of the policy at present, considers it possible that industry will in the future have to adjust itself to the altered conditions.

Local Exhibitions.

BRADFORD.—To wind up an Ideal Homes Exhibition, held for the first fortnight of March at Bradford—at which the Bradford Corporation Electricity Department had a series of highly attractive demonstration stands—a ball was given by the exhibition promoters on the evening of March 10th, and during the evening gold and silver medals were presented to the exhibitors whose stands had been declared, by a public ballot, to be the most popular. The Bradford Electricity Department secured the silver medal for local exhibits.

EPSOM.—During the whole of last week an electrical exhibition, organised by the municipal Electricity Department was held at the Lecture Hall, Epsom. Messrs. Absalom & Garland, a local firm of electrical contractors, actively co-operated with the Department and exhibited a representative range of "Magnet" domestic appliances and lighting fittings.

HAMPSTEAD, N.W.—Products of the General Electric Co., Ltd., are also to form part of a "Science in Industry" exhibition which is to be held from March 29th to 31st at the Haberdashers' Aske's Hampstead Schools, Westbere Road, N.W.2. These will include a working refrigerator unit, lamps, and valves, &c.

The Canadian Market.

In the course of a recent letter to us, Mr. J. R. Cowley, city electrical engineer of Saskatoon, Saskatchewan, says:—"There is no reason why British manufacturers should not obtain a larger share of purchases in Western Canada other than the lack of representation and knowledge as to what is being done by them along the lines in which we are interested. It is the intention of this department to obtain tenders from British firms before placing contracts for steam and electrical equipment in the future."

The B.E.A.M.A.

The annual meeting of the British Electrical and Allied Manufacturers' Association was held in London yesterday (Thursday).

New Swiss Company.

A company has lately been formed in Geneva (17, Boulevard Helvetique) with the title La Société des Applications Electriques, to exploit the Swiss agency for the Frigidaire Corporation, of Dayton, U.S.A.

New Indian Companies.

Among the concerns recently formed in India in connection with electricity supply, are the Meerut Electric Supply Co., 3, Burn Bastion Road, Delhi, with a capital of 15,00,000 rupees, and the Baluchistan Electric Supply Co., Quetta, capital 10,00,000 rupees.

Chinese Company's Reorganisation.

The Great Eastern Battery Manufacturing Co., Shanghai, recently underwent reorganisation, increasing its capital by 50 per cent. and adding a carbon manufacturing department. The company makes batteries for radio work, flashlamps and bells, including the component parts of these.

Book Notices.

"Modern Industry." By Malcolm Sparkes. Pp. 64. London: Student Christian Movement. Price 1s. 3d. net.—"This booklet," says the Publisher's Note, "is intended primarily for those who are concerned about the relationship between Christianity and social problems." Its sub-title is "The Christian Line of Development," and it leads up to the control of industry by "industrial councils," with a view to raising wages and lowering prices.

"The Electricity (Supply) Act, 1926." By T. J. Sophian. Pp. vi+62. London: Sweet & Maxwell, Ltd. Price 4s. 6d. net.

The *Queen's Engineering Works Magazine* for January, received last week, is appropriately dedicated to the memory of the late founder of the works and chairman of the company, Mr. W. H. Allen, a portrait of whom forms the frontispiece. It is an excellent number, of 94 pages, containing many interesting articles.

"Electric Switch and Controlling Gear," by Dr. C. C. Garrard. Third Edition. Pp. xiv+783; figs. 649. London: Ernest Benn, Ltd. Price 63s. net.

"The Operation of Receivers from A.C. Mains." Pp. 8; 3 diagrams. London: Marconiphone Co., Ltd. Price 6d.—This booklet contains useful information for the conversion of wireless receivers of the multi-valve type for operation entirely off a.c. mains with the aid of KL.1 valves. The subject is dealt with in general terms to make the information universally applicable. The additional components required are enumerated and their prices mentioned.

"Chemical Engineering and Chemical Catalogue." Third Edition. Edited by D. M. Newitt, Ph.D.; p. 404; fully illustrated. London: Leonard Hill. Price 10s. 6d.—In this new edition of the chemical engineering catalogue considerable additions have been made in both the number of subscribers and the tables and data contained therein.

"Electric Power Stations," by L. W. W. Morrow. Pp. viii+326; figs. 177. London: McGraw-Hill Publishing Co., Ltd. Price 20s.

Australian Radio Action.

The Sydney *Daily Telegraph* reported recently that writs had been issued on behalf of Amalgamated Wireless (Australasia), Ltd., claiming £25,000 against the provisional directors of Victoria Radio Interests Pty., Ltd., for alleged trade libel in an advertisement published in certain Melbourne newspapers.

A Commercial Travellers' Club.

Mr. C. J. Kebbeli, the secretary, has sent us particulars of the British Commercial Travellers' Club which is to be opened to-morrow (Saturday). The premises are situated at 24-28, New Oxford Street, W.C.1, and all the usual club facilities are provided. Membership is open to all commercial travellers and such other persons as may be approved by the Committee. The subscription is one guinea per annum.

A New Way of Packing Flex.

Messrs. W. T. Glover & Co., Ltd., have recently abandoned the old method of packing flex, *i.e.*, by coiling it, and are now doing it up in the form of balls as is usual with string. Packed in this way it can be pulled through a hole in the carton, whence it comes smooth, clean and unkinked.

Recent Contracts.

THE ALTON BATTERY COMPANY, LTD., has received a contract from the Nottingham Corporation for a battery of 256 cells for the North Wilford power station. During February three further orders for power station batteries were placed with the company, two being for Greece and one for Buenos Aires.

THE ELECTRIC FURNACE CO., LTD., 17, Victoria Street, S.W.1, has received further orders for high-frequency electric furnaces for the manufacture of high-grade tool steel from Messrs. W. Jessop & Co., Ltd., Sheffield, and J. Holtzer & Co., Unieux, France. Each installation will be capable of melting about four tons of alloy steel per day.

MESSRS. SIMON-CARVES, LTD., have recently secured an order from the Whitehaven Colliery Company for firing three boilers with pulverised low-grade fuel. Other orders which the company has in hand include the final extensions at the Prince's Station, Nechells, Birmingham, where four Simon-Carves boilers, each rated to evaporate 150,000 lb. per hour on normal load (180,000 lb. on overload) are being installed with coal drying, pulverising and feeding equipment on the company's "Central" system; extensions at the Peterborough Corporation, including coal drying, pulverising and feeding equipment, 12 tons per hour; and for the Tilmanstone (Kent) Collieries, Ltd., the addition of Simon-Carves patent water-cooled combustion chambers to two Stirling boilers and the necessary pulverising plant.

THE PIRELLI-GENERAL CABLE WORKS, LTD., has secured an order from the Coventry Corporation for the supply and installation of approximately 30 miles of 3-core cable for a working pressure of 33,000 V. Each core of these cables will be separately lead sheathed and the three cores laid up together. The cable is made circular by means of tanned jute fillings, and the whole is then lapped with two compounded hessian tapes, which form the bedding for the single wire armour. The cable is compounded double hessian taped overall. The cables will connect the new super power station at Hawkesbury with the existing generating station at Sandy Lane, and with two sub-stations.

THE GENERAL ELECTRIC CO., LTD., has recently secured the contract for a complete cyclorama, cloud apparatus, panorama projectors, and a full battery of horizon colour floods for the New Carlton Theatre, Haymarket. It is also supplying a complete set of special 100-contact open coil metallic type dimmers arranged for remote control; the contractors are the Berkley Engineering Co. A further contract has also been secured for the stage lighting equipment which is being installed at the new Park Lane Hotel, W., which is to be opened shortly. The electrical contractors are Messrs. Tredegars.

Messrs. HICK, HARGREAVES & CO., LTD., have secured the order for the whole of the condensing plant and auxiliaries for the new Hams Hall generating station for the Birmingham Corporation.

Prices of Materials.

Messrs. James Forster & Co. reported on March 12th that the lead market became unsettled by the sudden declaration of a considerable tonnage of lead for early arrival from Burma, which brought about a fall on March 7th and 8th of 13s. 9d. a ton. The tone was afterwards steady, with prices practically unchanged, closing at £28 2s. 6d. for March, £28 6s. 3d. for April, £28 8s. 9d. for May, and £28 11s. 3d. for June. "In consequence of the drop in values, the home demand quietened down, consumers being somewhat apprehensive of any further fall. Buying, however, must be resumed before long, and the steadier conditions now prevailing will help confidence to return."

Messrs. Lindsay & Williams, Ltd., following their usual practice, have sent us a copy of their chart showing the course of prices of raw materials for the cable industry during 1926. The curves deal with American cotton, plantation rubber, h.c. copper wire, and pig lead.

Prices of Raw Materials.

Messrs. F. Smith & Co. report, March 15th: Copper (electrolytic) bars, £63, 2s. 6d. dec.: ditto ditto sheets, no change; ditto ditto wire rods, £73, 2s. 6d. dec.; ditto ditto h.c. wire, 9 3/16d., 1/16d. dec.

Messrs. James & Shakespeare report, March 15th: No change in the prices of copper bar, sheets and rod, and English pig lead.

Messrs. Edward Till & Co. report, March 15th: India-rubber, Para fine, 1s. 5¼d., ¾d. dec.

Greek Telephone Concessions.

For the purpose of reorganising and extending the Greek telephone system, a new company was formed a little time ago with a capital of £500,000. Of this amount, 80 per cent. was subscribed by Siemens & Halske, and the remaining £100,000 by a Greek group. In this connection it may be recalled that about the middle of last year it was reported that a Belgian-English group had been granted a concession for the extension of the Greek telephone system.

Lighting and Power Notes.

Argentina.—HYDRO-ELECTRIC DEVELOPMENT.—By Presidential decree a commission is to be nominated to make a complete survey of the water power resources of Argentina. For this purpose a Hydraulic Investigation Bureau has been established under the Ministry of Public Works. The chief engineer will be Señor Don Lépori, who has been sent to study the principal water power resources of the United States and their application.—*Reuter's Trade Service* (Buenos Aires).

Australia.—COLLIE (W.A.).—The *Electrical Engineer* of *Australia and New Zealand* reports that steps are being taken to proceed with the electricity scheme for the towns of Collie and Bunbury and the surrounding districts in Western Australia. An Act of Parliament authorising the scheme and laying down the lines upon which it is to be controlled and financed has been passed. The undertaking will be administered by a trust consisting of five members, three of whom, including the chairman, will be appointed by the Government, and the other two by the municipalities of Collie and Bunbury. Of the necessary capital, the municipality of Collie will subscribe £60,000, the Bunbury municipality £50,000, and the Government £110,000. It is estimated that a station to meet the expected demand can be erected at a cost of £216,000. The present proposal is to supply the towns named and all towns and districts within a radius of about 40 miles of Collie. The energy will be sold in bulk to the various local authorities. Bulk supplies will be provided also for the coal mines at Collie. Electricity will be supplied to the mines at 1¼d. per kWh and to other consumers at 2d. per kWh.

Barmouth.—ELECTRICITY SUPPLY.—It was reported at a recent meeting of the Urban District Council that the Electricity Commissioners have decided not to proceed with an application from Aberartro for an Order to supply electricity in the district. The application has been under consideration for three years, and £20,000 has been spent on initial work by the promoters. A sub-committee has been appointed to consider alternative schemes.

Barrow.—EXTENSION SCHEME REJECTED.—The Electricity Commissioners have refused to sanction the scheme for extensions to the Corporation generating station at a cost of £60,000, and propose that other arrangements should be made to meet local requirements. The Council has appointed a deputation to interview the Commissioners.

LOAN SANCTIONED.—The Town Council has received sanction to the borrowing of £44,591 for main transmission line, mains and services, sub-station equipment and meters.

Brazil.—HYDRO-ELECTRIC DEVELOPMENT.—The Governor of the State of Rio de Janeiro has ordered a report to be prepared on the water-power resources of the central regions with a view to furnishing power for industrial purposes to several municipalities, including Sao Francisco de Paula, Santa Maria Magdalena, and Sao Sebastiao do Alto. Industrial plants will be first established in the larger towns such as Campos Macaché, and Nictheroy.—*Reuter's Trade Service* (Rio de Janeiro).

Bury (Lancs.).—STREET LIGHTING.—The Town Council has applied for sanction to a loan of £5,000 for lighting the main roads in the borough by electricity.

Canada.—ELECTRICAL DEVELOPMENT.—A mercury-arc rectifier sub-station was put into operation at Verdun, Que., on February 9th by the Montreal Tramways Co. to meet the increasing needs for power in the city of Verdun and the vicinity, at a cost of $200,000. The station pressure is 12,600 V a.c., which is converted by transformers and rectifiers into direct current at 600 V. The electrical equipment was supplied by the Brown Boveri Co. of Baden, Switzerland; Nicholson Construction, Ltd., were the building contractors.

The Algoma District Power Company has decided to install an additional unit of 2,000 h.p. at Michipicoten Falls at once; plans are under consideration for rendering available the full capacity of the Falls. To do this will involve the removal of a large hill 150 ft. high and about 100 yards in length, so that the present bend of the river can be tapped for a new sluiceway. This will be a difficult and costly work, and a force of engineers is engaged in a preliminary survey. It is planned to remove the loose sand by hydraulic piping, and, in addition, there will be a great deal of rock work.

Cardiff.—ASSISTED WIRING SCHEME.—The Finance Committee has considered the proposal of the Electricity Committee to set aside £20,000 towards the cost of an assisted wiring scheme, under which the Corporation would wire houses and install the necessary electrical fittings for lighting and heating purposes, and spread the cost over a period of years. According to the *Western Mail*, the chairman of the Electricity Committee states there are some 40,000 houses in the city, of which at least 30,000 do not use electricity. It is estimated that orders would come in for the wiring of at least 2,000 houses under the proposed scheme, and as it is not intended that the scheme should apply to houses with more than seven lights, the average cost of installation is placed at £10 per house. Instead of charging 4½d. per kWh, the customer would be charged, say, 8d. per kWh until the difference in the unit charge had wiped out the cost of the installation. The matter has been referred back to the Electricity Committee to prepare a complete scheme.

Clitheroe.—INAUGURATION OF SUPPLY.—An electricity supply for the district was formally inaugurated by the Mayor on March 9th. Electricity is supplied from the Lancashire Electric Power Co.'s station at Padiham to the Council's sub-station, in which two 300-kW transformers are installed. Accommodation has been provided for four additional transformers. The scheme included the laying of 14,000 yd. of distributing cable, 4,500 yd. of public light cable, and 5,000 yd. of e.h.p. cable, and the cost was £25,000. To celebrate the event a scheme of illumination was carried out.

Continental.—RUSSIA.—The Glavelektro has presented a report to the Gosplan (State Planning Commission) on the plan for the electrification of the Donetz basin. The Glavelektro is in favour of the construction of small stations of from 12,000 to 20,000 kW, in addition to large stations of from 80,000 to 100,000 kW. Investigations are to be made this year in three districts in order to determine the site of a regional power station of 100,000 kW, so that a definite start can be made during the next financial year with the construction of the station. The independent construction of power stations, utilising gas plant, by metal works is approved, and it is estimated that during the next five years it will be necessary to order 13 sets with a capacity of 3,500 kW for the works belonging to the Southern Steel Trust (Yugostal). By the year 1930-1931, the Donetz basin will have, according to the plan, regional and subsidiary power stations with a total capacity of from 240,000 to 300,000 kW, excluding independent installations at various works. The Glavelektro insists on the necessity of using not only coal dust and coal of inferior quality, but also other waste matter, such as steam used in certain processes and gases from coke ovens and blast furnaces. —*Reuter's Trade Service* (Moscow).

A *Reuter* message from Leningrad says that at a recent meeting of the regional Elektroplan a report on the proposal for a hydro-electric power station on the Neva (Nevstrol) was finally approved. The station is to have a capacity of 60,000 kW, and the cost of construction is placed at 74,000,000 roubles. The plan is being sent to Moscow for approval by the Glavelektro.

The Berlin correspondent of the *Financial News* reports that the Soviet Government, after several years of consideration, has decided to carry out a project for the construction of a hydro-electric power plant on the river Dnieper and for improving the navigation facilities of the river. The Siemens Construction Union has been asked to send several engineers for the supervision of the work, and it is also to submit plans and details for the project. An American firm has also obtained a similar contract. The scheme is said to include the construction of a power station with a capacity of 650,000 h.p.

GERMANY.—What is claimed to be the largest Diesel engine for electricity generation purposes so far built has recently been constructed by the Blohm & Voss Shipbuilding and Engineering Co., of Hamburg, Germany, for the Neuthof power station of the Hamburgische Elektricitätswerke Gesellschaft. The engine, which develops 15,000 h.p., comprises nine cylinders having a bore and stroke of 860 mm. by 1,500 mm., the normal speed being 94 r.p.m. The engine is of the two-cycle type with a new system of scavenging the burnt gases, and is 76½ ft. in length, 14 ft. in width, and 38½ ft. in height. The three-phase generator, built by the Siemens-Schuckert Co., of Berlin, to which the engine is directly coupled, is also claimed to be the largest so far constructed; it is a 50-period, 6,000/6,300-volt machine and has a capacity of from 12,000 to 13,000 kVA. The stator has an external diameter of 26.8 ft. and a width of 7 ft. 2 in. The machine weighs altogether 233 tons, of which the flywheel rotor, which has 32 pairs of poles, is responsible for 111 tons.

SWITZERLAND.—Contracts have been placed for the construction of the Ryburg-Schworstadt hydro-electric power station which is to be erected on the banks of the Rhine. The station will be built by the Motor Columbus Co., of Baden, and the transmission lines will be erected by the Rheinfelden Power Transmission Co. and the Baden Provincial Electricity Supply Co., of Carlsruhe. The station will have an output of 640 million kWh per annum.

Crediton.—ELECTRICITY SUPPLY.—At a recent meeting of the Urban District Council a letter was read from Mr. Melhuish, the Council's electrical engineer, stating that the proposed scheme for the supply of electricity to the town had already dragged on for about five years and that it was now absolutely necessary for the Council to appoint an engineer to supervise the work, more particularly with regard to the erection of the h.p. lines from Exeter to Crediton. He stated that when in 1922 he arranged to assist the Council with the proposed scheme the intention was to have a small generating station and construct a distribution network in the town. Since then, however, that scheme had been abandoned, and it had been decided to take a supply from Exeter. He suggested that he should resign his appointment when the Council had chosen an engineer, which must be before the work was started, but he was prepared to act as honorary consulting engineer. The Council decided to invite Mr. Melhuish to meet it at once for a discussion of the matter.

Crowborough.—ELECTRICITY IN BULK.—The Crowborough District Gas and Electricity Co., which is carrying out extensions, has arranged for a bulk supply of electricity for the Tunbridge Wells Corporation.

Hastings.—ELECTRICITY EXTENSIONS.—The Electricity Committee reports that, owing to the increase in load on the electricity mains, it has become necessary to extend and renew h.p. mains and erect and equip new sub-stations at a cost of £27,500, for which purpose application is to be made for consent to a loan.

Hove.—LOAN.—The Town Council is applying for sanction to a loan of £95,088 for electricity purposes.

Liverpool.—LOANS.—Application is being made by the Electricity Committee for sanction to the borrowing of the following amounts:—Sub-stations: Buildings, £15,800; transformers, switchgear, &c., £27,600. Lister Drive power station: Transformers, switchgear, &c., £69,200. Static sub-stations: Buildings, £80,000; plant, £150,000. Purchase of coal wagons, £15,000. H.p. and l.p. mains, £300,000.

ELECTRICITY EXTENSIONS.—The following extensions are to be carried out:—Supply from Queen's Drive sub-station to Derby Lane area: L.p. mains, £3,855; h.p. mains, £6,214; a.c. mains, £4,370. Extension of mains to Woolton district, £3,070. Sub-station at Hightown, and l.p. mains to be laid at an estimated cost of £2,180.

London.—WOOLWICH.—The Town Council has decided to lay a main transmission line in duplicate from Globe Lane to the Eltham sub-station at an estimated cost of £37,000, plus about £3,000 for switchgear.

FULHAM.—The Finance Committee has recommended to the Borough Council that application be made for sanction to the borrowing of £1,800 for the erection of a combined gatehouse and sub-station at the entrance to the electricity works, and £2,000 for the provision of sub-station plant and equipment.

PARLIAMENTARY BILL.—The *Financial News* reports that the London and Home Counties Joint Electricity Authority is introducing a new Pill into Parliament for power to erect a generating station at Dukes Meadows, Chiswick, the construction of railways, docks, and other works, and the acquisi-

tion of land. Provision will be made for entering into agreements with Chiswick Urban District Council and others, and for power to abstract water from the Thames, &c. The Examiners of Private Bills found that the measure deposited at the end of last year failed in several particulars to comply with the Standing Orders of Parliament.

Maidenhead.—ELECTRICITY IN SMALL HOUSES.—The Town Council has decided to supply electricity for cooking and lighting to the new housing site in Cox Green Road under a two-part tariff, consisting of a fixed charge of 1s. 8d. per week, plus 1½d. per kWh for electricity consumed. If the Housing Committee pays a preliminary amount of £5 per house on account of wiring, &c., the fixed charge will be reduced to 1s. 5½d. per week.

Peterborough.—ELECTRICITY CHARGES.—The Town Council has decided to offer an alternative tariff to consumers of electricity for domestic purposes of 12½ per cent. on the ratable value or assessment, plus £1 per annum service charge, and 1d. per kWh for electricity consumed.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

WHITBY.—Lighting: 8d. per kWh. Heating: 1½d. per kWh. Power: First 50 kWh per quarter, 6d. per kWh; next 950 kW, 3d. per kWh; beyond, 2d. per kWh.

DOVER.—The 5 per cent. increase made owing to the coal dispute has been withdrawn.

COLCHESTER.—The temporary increase of 25 per cent. is to be discontinued.

CONWAY.—Lighting: From 7d. to 6d. per kWh.

LEICESTER.—The temporary increase in charges of 10 per cent. is to be discontinued.

WEYMOUTH.—Lighting: From 8d. to 7d. per kWh. Heating and power: From 2½d. to 2d. per kWh. Cooking and contract: From 2d. to 1½d. per kWh. Public lighting: From 4d. to 3½d. per kWh.

PORTSMOUTH.—A reduction of ½d. per kWh under the following tariffs:—Domestic; business premises, &c. (maximum demand); power; and heating and cooking not taken under the domestic tariff. Lighting under the alternative flat rate: A reduction of 1d. per kWh.

DOUGLAS (ISLE OF MAN).—Lighting: From 8d. to 7d. per kWh. Power: From 2½d. to 2d. per kWh. Cooking: From 1½d. to 1¼d. per kWh.

CARMARTHEN.—*The Carmarthen Electric Supply Co., Ltd.*—Heating and cooking: 1½d. per kWh flat rate all the year round.

South Africa.—WELLINGTON.—According to the *South African Engineer* the Municipal Council for some time past has been hard pressed to maintain a supply of electricity, but negotiations have now been concluded whereby the Electricity Supply Commission will give a supply of electrical energy from its Capetown undertaking, through an extension of the 33,000-V transmission line which has been erected as far as Huguenot. The supply is required urgently, and pending completion of the Commission's generating station at Salt River, it will be given from the Capetown Corporation's power station in Dock Road.

Southport.—ASSISTED WIRING SCHEME.—The Corporation Electricity Committee has prepared an assisted wiring scheme intended to apply to old properties where gas is used. The scheme, which is not to apply to new houses, provides that such installations are to have a maximum of 12 lighting points, and are to be carried out by local electrical contractors, who must either be registered or members of the Electrical Contractors' Association. The proposals were submitted to a recent meeting of the Town Council, and, after discussion, referred back.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the following authorities:—The Burford Electric Light and Power Co., Ltd., to supply electricity in certain parishes in the rural district of Witney; the Oswestry Electric Lighting and Power Co., Ltd., to extend its area of electricity supply so as to include the parishes of Selattyn, Oswestry Rural, and Whittington; Weymouth Corporation, to supply in the rural district of Weymouth, the urban district of Portland and certain parts of the rural districts of Dorchester, and Wareham and Purbeck; the West Cornwall Electricity Supply Co., Ltd., to supply electricity in the urban districts of St. Just, Madron, Paul, Ludgvan, Hayle, Phillack, Padstow, and Wadebridge, and the rural districts of West Penwith, Redruth, Helston, East Kerrier, Truro, and St. Columb Major.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising the Darlington Corporation to supply electricity in parts of the rural districts of Darlington and Croft.

Stockton-on-Tees.—LOAN.—The borough electrical engineer has recommended that application be made for a further loan of £10,000 for mains and services.

Stoke-on-Trent.—CONFERENCE OF COMMITTEES.—The Corporation has asked the chairmen and vice-chairmen of the Housing, Gas and Electricity Committees to confer on the question of the supply of gas and electricity to housing estates with a view to saving expenditure on the provision of duplicate systems of pipes and cables.

Torpoint.—ELECTRICITY SUPPLY.—The Urban District Council has rejected the offers made by the Torpoint Electricity Supply Co., Ltd., and is to proceed with its own application for an electricity Order.

Torquay.—LOANS.—The Town Council has received sanction to a loan of £12,500 for mains and services, and has applied for sanction to a further loan of £8,199, being the estimated expenditure on the first section of additional h.p. mains, and £2,500 for transformers and switchgear for the main substation in Upton Valley.

Tunbridge Wells.—LOAN.—The Town Council has applied for sanction to a loan of £28,395 for electricity purposes.

PRICE REDUCTION.—A reduction of ¼d. per kWh has been made to consumers on the ratable value and room basis systems of charges, making the price 1d. per kWh in the borough, and 1¼d. outside the borough.

Walton-on-Thames. — PURCHASE OF UNDERTAKING.—The Urban District Council has received sanction to the purchase of the local electricity undertaking of the Urban Electric Supply Co., Ltd., and has received permission to borrow £90,000 for the purpose.

Watford.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £5,000 for transformers and switchgear, £2,500 for meters, and £30,000 for mains and services.

Tramway and Railway Notes.

Australia.—RAILWAY ELECTRIFICATION.—It is anticipated that the electrification of the Milson's Point to Hornsby line, New South Wales railways, will be completed about the middle of this year, after which conversion of the main suburban line will commence.

Brazil.—RAILWAY IMPROVEMENTS.—Tenders are being considered for improvements to the Sorocabana Railway, owned by the State of Sao Paulo, leased to the Sorocabana Co. and controlled by the Brazilian Railway Co. The scheme includes the laying of 140 km. of double track, the electrification of over 100 km. of line, and the erection of a new passenger station at Sao Paulo, at an estimated cost of 11,000 to 11,500 contos of reis.—*Reuter's Trade Service* (Sao Paulo).

Continental.—SWITZERLAND.—Work is progressing on the Federal railways, and with the completion of the fourth power station at Vernayaz (Simplon district) additional supplies of electrical energy will be placed at the disposal of the State. It is estimated that Vernayaz will have an output of over 100,000 h.p.

FRANCE.—It is reported that the whole suburban line from Paris to St. Germain will be electrically operated as from March 20th. Express trains will cover the distance (21 km.) in 27 minutes instead of 50 minutes as at present. On March 2nd an electric train, made up of four coaches, was tested on the section from Rueil to St. Germain. The trial was satisfactory, particularly in the St. Germain tunnel, where the gradient is a steep one.

In the course of a recent paper read before the French Society for the Encouragement of National Industry on "The Practical Application of Wireless Telephony," Commandant L. Julien mentioned that experiments had been made by the Paris Tramways Co. with one of its tower wagons used for repairing overhead conductors fitted with wireless apparatus so that those in charge of the vehicle could be communicated with while out at work. The tests had been made on a wavelength of 100 metres and a power of 100 watts, and had proved quite successful within a certain range. In order, however, to enable communication to be established with the most distant sections of the tramway system, it would be necessary to increase the power to 250 watts.

Croydon.—ABANDONMENT OF ROUTE.—The *Daily Telegraph* reports that the Borough Council, on March 7th, confirmed its decision of January 24th to close down the Addiscombe section of the tramway on March 31st. The motion was carried by 30 votes to 18, after the Council had heard a deputation which presented a petition of protest signed by over 5,000 residents. The Council also resolved to accept the London General Omnibus Company's offer of a service of 'buses in lieu of trams between Croydon High Street and Woodside railway station. The deficiency on the whole of the tramway undertaking for the year ending this month was reported to be £66,000, and the estimated deficiency for the coming year was given as £70,000.

Glasgow.—TRAMWAY EXTENSION.—The Corporation Tramways Committee is to consider the extension of the tramway on the London Road beyond Auchenshuggle when the bridge widening at Mount Vernon is completed.

London.—TRAMCAR IMPROVEMENTS.—The Highways Committee of the L.C.C. has recommended the expenditure of £54,000 for the provision of rearranged seating and other improvements on 250 tramcars.

Tube Station Site.—The Underground Railway Co. has bought a site for a station at Arnos Grove, Palmer's Green. Lord Ashfield, in a letter to the secretary of the Middlesex Federation of Ratepayers' Associations, states that the reason for the purchase at the present time is the development which is about to be started on the Arnos Grove estate, and which might result in the land becoming more costly to acquire at a later date, when it might be required in connection with the extension of the London Electric Railways northwards from Finsbury Park.

Southern Railway.—New Line.—There is a good prospect of a start being made in the near future with the construction of the Wimbledon and Sutton Railway. Authorisation for the work was obtained in 1910, but from time to time it has been delayed for various reasons. Under its existing statutory powers the Southern Railway Co. is required to complete the railway not later than July, 1928, but it is promoting a Bill in Parliament which includes a clause extending that period. According to *The Times*, the company has intimated to the Wimbledon Town Council that it contemplates beginning the construction of the railway in the early part of next year, and of completing the work within two years from the start. Negotiations are being pushed forward for the acquisition of the necessary land. In view of this, the Wimbledon Corporation has refrained from petitioning against the Bill.

Telegraph and Telephone Notes.

"Beam" Radio-telegraphy.—Australian Service Tests.—A report issued by Marconi's Wireless Telegraph Co. states that the short-wave wireless "beam" stations which have been built for the British Post Office by the Company, at Grimsby and Skegness, for communication with Australia, have successfully passed their official seven-days' test, and the Company has been informed by the General Post Office that they have more than fulfilled the conditions required by the contract.

Bulgaria.—New Radio Station.—Four well-known European firms (two German, one French, and one British) have tendered for the construction and equipment of a wireless telegraph and telephone station at Sofia to cost about 30,000,000 leva, a sum greatly exceeded by many of the tenders. The German firm of Lorenz (Berlin) made two offers, one for a station costing 95,000,000 leva, and the other for a station costing 42,000,000 leva. The Telefunken firm (Berlin) also submitted two tenders, one at 54,000,000 leva and the other at 50,000,000 leva. The Marconi concern (London) submitted two tenders, one at 60,000,000 leva and the other at 40,500,000 leva; and the French concern (Telephones Sans Fil) submitted three, the first at 30,950,000 leva, the second at 32,200,000 leva, and the third at 29,000,000 leva. The offers are being considered, and a decision is expected shortly.—*Reuter's Trade Service* (Sofia).

Cape Verde Islands.—Radio-Telegraph Service.—Marconi's Wireless Telegraph Co., Ltd., announces the inauguration of a telegraph service from London to the Cape Verde Islands. Telegrams for transmission to the Islands will be accepted marked "*via* Marconi" at any Marconi office, or at any railway, or postal telegraph, office in Great Britain and Ireland. The ordinary rate per word is 2s. 3d. to St. Vincent and 3s. 1d. to St. Thiago; the deferred rate is half, and the urgent rate triple, these amounts.

New Zealand.—Telegraph and Telephone Service.—The capital expended during the year ended March 31st, 1926, on improving the telegraph facilities in New Zealand to meet the standard of modern requirements, and on extending the telephone exchanges to provide for additional business, amounted to £931,661. The telegraph and telephone revenue showed an increase of £146,642 over that of 1924-25—the previous best year in the history of the telegraph and telephone service. Pole-line and wire work carried out during the year represented the erection of 1,776 miles of pole-line and 15,640 miles of open aerial wire; in addition, 270 miles of lead-covered cable were laid for subscribers' circuits, containing 73,700 miles of wire. As a result of special efforts made during the year to overtake the arrears of telephone subscribers' services, a new record was established for new connections, the total for the year (13,368) being 64 in excess of the number connected during any previous year.

The Telephone Service.—Comparative Progress.—In reply to a recent question in the House of Commons, the Postmaster-General gave the following figures as representative of the number of telephones in use per 1,000 of population in the countries named on December 31st, 1925:—Great Britain (including Northern Ireland), 31; United States of America, 150; Canada, 130; Denmark, 95; New Zealand, 94; Sweden, 72; Australia, 68; Norway, 66; Switzerland, 50; Germany, 43; Netherlands, 30; Austria, 23; Belgium, 22; Argentina, 19; France, 18; Japan, 10. No later figures for those countries were available, he said, but the figure for Great Britain on January 31st, 1927, was 33.

Transatlantic Telephony.—Cuba-England Service.—A telephone service between Cuba and England was inaugurated on March 11th by Dr. Martinez Ortiz, Cuban Secretary of State, who talked direct to the British Foreign Office with Mr. Locker Lampson, Under Secretary of State, and the Cuban Minister in London. The charges will be 87 dollars for the first three minutes and 29 dollars for each additional minute.—*Reuter* (Havana).

Running Cost.—In reply to a question in the House of Commons, Sir W. Mitchell-Thomson, Postmaster-General, said that for the period January 7th to 31st the running costs of the British end of the Transatlantic telephone service, including sundry expenses incidental to the initiation of the service, amounted to approximately £2,000; and plant charges, depreciation and interest, to a further £1,900. It was expected that the service would be self-supporting.

New Receiving Station.—The G.P.O. staff at Kemback (Cupar, Fife) has made rapid progress with the erection of power house, receiving room, and antenna system, and by next month it is expected the new station will be ready to receive wireless telephony from America, which will be transmitted by underground cable direct from Kemback to London. The aerial consists of three parallel wires, carried on telegraph poles, three and a quarter miles in length and two miles apart. It is perfectly directional, being in correct line with the American sending station. British and American receiving panels are being erected and 12 valves will be used on each set. A staff of 12 men will be employed, four being on each watch.

Radio Notes.

Dominican Republic.—Service Restarted.—Towards the middle of March broadcasting was to recommence in the Dominican Republic under the auspices of the Radio-telegraphic Service, from station H-1-one-C, installed by the Radio Club of Santo Domingo.—*Reuter's Trade Service* (Port-au-Prince).

Licences.—Last Year's Figures.—It was recently announced officially that the number of broadcast wireless receiving licences issued in 1926 totalled 2,178,000, as compared with 1,642,000 in 1925. The total receipts amounted to £1,089,000 during 1926, against £821,000 in 1925.

North Wales.—Relay Station.—The Corporation of Bangor, after discussing the proposal for the establishment of a broadcasting relay station in North Wales, has decided to make formal application for the station to be located in that town.

South Africa.—New Company.—It is understood that negotiations have been concluded for the formation of a South African broadcasting company to take over the Johannesburg area. A share preference will be given to listeners, who will receive the first 10 per cent. of profits, the Government sharing the remainder with them and using its position to reduce costs, says the *Daily Mail*. The company's licensing conditions provide for the erection of a powerful station within nine months. The Government is to appoint two directors and the Radio Society one. To check piracy, the sale of wireless set parts to non-licence holders will be prohibited. The Government retains the right to take over the service after five years.

Turkey.—First Station.—Turkey has the distinction of having installed the first broadcasting station of the Near East. It is located at Stamboul and began operations last month, says *World Radio*, and it is anticipated that a second station will be working at Angora in a year's time. It was constructed by the Compagnie Générale de Télégraphie Sans Fil, Paris, with a power of 6 kW. The station is actually situated in Osmanie, but the studio is in the G.P.O., Stamboul, nine miles of cable linking it to the transmitter. Turkey's population is about 14 millions.

United States.—Underground Transmission.—Station WRNY, in New York City, is preparing to broadcast on a short wave below fifty metres, simultaneously with the regular broadcast on 375 metres. In addition, with the co-operation of Prof. James H. Rogers, the station will shortly go "on the air" with a buried aerial. As soon as the weather permits, says *World Radio*, a terra-cotta pipe, through which the aerial will be drawn, will be buried about 6 ft. under ground at Coytesville, N.J., where the transmitter is located. During the war extreme ranges were obtained by underground transmission, and WRNY will be the first station in America to broadcast on such an underground aerial.

A report issued at Washington, D.C., by the United States Department of Commerce, says that there are 164 broadcasting stations in Europe, over 700 in the United States, 85 in the remainder of North America, 38 in South America, 16 in Asia, 28 in Oceania, and 9 in Africa.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Adwick-le-Street.—March 21st. Urban District Council. Cables, boxes, pillars, and necessary materials and apparatus for a distribution network scheme. (March 4th.)

Australia.—MELBOURNE.—April 26th. Postmaster-General's Department. Telephone switches. (B.X. 3254.)* Instrument cords. (B.X. 3255.)*
April 12th. Cord-type switchboards. (B.X. 3280.)*
May 10th. Telephone relays. (B.X. 3333.)*
May 17th. Resistances and reactances. (B.X. 3307.)*
May 23rd. State Electricity Commission. Switchgear and accessories. (B.X. 3285.)*
May 9th. 6,600-V transformers and spares. (B.X. 3331.)*
SYDNEY.—May 9th. Electricity Department. Suction auxiliary switchgear. (B.X. 3338.)*

Ayr.—March 23rd. Ayrshire Education Authority. Electric lighting and central heating of new primary school at Irvine. Plans with Master of Works, Education Offices.

Beckenham.—April 4th. Electricity Department. Three e.h.p. transformer sub-station switchboards. (See this issue.)

Bristol.—April 11th. Electricity Department. 39 miles (approx.) 3-core, paper-insulated cable. (See this issue.)

Dundee.—Cleansing Department. Electric lighting installation for the Department's premises at Broughty Ferry. Mr. George Baxter, city engineer, 91, Commercial Street, Dundee.

Edinburgh. — March 21st. Electricity Department. Twelve months' supply of cables, box frames and covers, house service fuse boxes and fuseboards, meters and meter boards. (March 4th.)

Erith.—March 24th. Electricity Department. H.p. and l.p. underground cables, joint boxes, &c. (See this issue.)

Halifax.—March 22nd. Board of Guardians. Electrical fittings for six months. Mr. A. T. Longbotham, clerk, Carlton Street.

Hazel Grove and Bramhall.—March 23rd. Urban District Council. One oil circuit breaker and kiosk and seven 20-kW transformers and kiosks, cables and two e.h.p. sub-station switchgear panels. (March 4th.)

Ilford. — March 22nd. One 500-kW rotary convertor, with transformer, switchgear, &c. (March 4th.)

India.—March 22nd. India Store Department. Two 250-kW Diesel-engine alternator sets, with switchgear, transformer, &c. (February 18th.) 30,000 oil insulators. (March 4th.)

Kettering.—March 23rd. Electricity Department. E.h.p. and l.p. armoured cables and one 1,000-kVA transformer. (March 4th.)

Kilmarnock.—April 6th. Ayrshire Electricity Board. Two water-tube boilers, with superheaters, economisers, air heaters, mechanical stokers, and coal-handling plant. (See this issue.)

London.—HOLBORN.—April 13th. Board of Guardians. Electric lighting installation at the London Road, Mitcham, schools. (See this issue.)
SHOREDITCH.—March 22nd. Board of Guardians. Electric ovens, fish fryer, and griller. Mr. J. C. Clay, clerk, 213, Kingsland Road, E.2.
LONDON COUNTY COUNCIL.—March 29th. Electric lighting installation for Sudbourne Road elementary school, Brixton, S.W. (approx. 136 points). (See this issue.)

Manchester.—March 22nd. Tramways Department. Copper bonds. Mr. H. Mattinson, general manager, 55, Piccadilly, Manchester.
March 22nd. Board of Guardians. Electric main cable required at Styal Cottage Homes, Styal. Mr. E. Hargreaves, Superintendent of Works, Union Offices, All Saints.

New Zealand. — WELLINGTON.—May 31st. Public Works Department. 50-kVA transformers for the Waikaremoana electric power scheme. (B.X. 3294.)* 50-kVA transformer for Arapuni scheme. (B.X. 3293.)*
April 5th. 500-kVA transformers for the Lake Coleridge power scheme. (B.X. 3343.)*
June 7th. Railway sub-station equipment, Lake Coleridge electric power scheme. (B.X. 3295.)*
May 4th. General Post Office, Stores Division. Sub-station protectors. (B.X. 3286.)*
June 13th. New Zealand Railways. Machine tools, workshop equipment and overhead electric travelling cranes. (A.X. 4344.)*
June 6th. Six electric locomotives. (A.X. 4355.)* Overhead equipment for the Christchurch-Lyttelton electrification scheme. (B.X. 3301.)*

Oldham.—March 26th. Electricity Department. One 80-ton electric travelling crane. (March 4th.)

Plympton St. Mary.—March 31st. Urban District Council. H.p. cables, underground and overhead mains, h.p. and l.p. switchgear, transformers and transformer kiosks. (March 11th.)

Rathmines and Rathgar.—March 26th. Urban District Council. Electrical supplies, including lamps, meters, fuse boxes, copper wire, engine-room stores. Forms of tender from the Electricity Works.

Rhondda.—March 26th. Electricity Department. Twelve months' supply a.c. ordinary and prepayment meters, mains and house service material. (February 25th.)

Rochdale.—March 21st. Electric lighting installation, Bamford Workmen's Club. Particulars from the Secretary.

Roumania.—BUKAREST.—April 2nd. 600,000 porcelain insulators. (B.X. 3314.)*

Sheffield.—New Century Pictures, Ltd. Electric lighting installation at the Albert Hall, Sheffield. Particulars from Messrs. Chadwick, Watson & Co., 9, Albion Street, Leeds.

South Africa.—JOHANNESBURG.—April 8th. Municipal Council. Ironclad cut-outs. (B.X. 3332.)*
DURBAN, NATAL.—March 28th. Corporation. 9¼ miles 6,600-V cable, 17 miles combined pilot and telephone cable. (See this issue.)

Southend-on-Sea.—April 9th. Light Railways and Electricity Department. Remote-controlled rotary convertors. (March 11th.)

Walthamstow.—March 23rd. Electricity Department. L.p. cables and v.i.r. wires for 12 months. (March 11th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Belgium.—Belgian, German, French, Czecho-Slovakian, Dutch and British (British Insulated Cables, Ltd.) companies competed early last week for an armoured cable contract for the municipal authorities of Saint Gilles, Brussels. The lowest offer was that of a Belgian concern.

East Ham.—Cleansing Committee. Recommended:—
New battery for electric vehicle (£219).—Chloride Electrical Storage Co., Ltd.

Eastbourne.—Electricity Committee.
Coal handling plant—

W. J. Jenkins & Co., Ltd. (Accepted.) ...	**£1,144**
New Conveyor Co.	1,415
Naylor Bros., Ltd.	1,528
Mitchell Conveyor Co.	1,565
Babcock & Wilcox, Ltd.	1,754
Ed. Bennis & Co., Ltd.	1,795

Hull.—Electricity Committee. Accepted:—
Electrical equipment for two electric houses on the Cottingham Housing Estate (£152.—W. L. Harrison, Ltd.
Telephones Committee. Accepted:—
Cable (£897).—W. F. Dennis & Co.

India.—BOMBAY.—Corporation. Accepted:—
Re-wiring municipal head office building (Rs.11,775).—Sterling Electric Works.

Leeds.—Tramways Committee. Accepted:—
200 yd. manganese steel guard rail (£360).—Edgar Allen and Co., Ltd.

London.—ADMIRALTY. Accepted:—
Resistance rod.—Edison Swan Electric Co., Ltd.
ISLINGTON.—Borough Council.—The contract for electric lamps for 12 months has been placed with the Milton Electrical Co., Ltd.; Edison Swan Electric Co., Ltd., has received the contract for electric lamp globes.

SHOREDITCH.—Lighting Committee. Recommended:—
Cable (£6,118).—W. T. Glover & Co., Ltd.
1,500-kW remote-controlled automatic converting plant and switchgear (£9,453).—Hewittic Electric Co., Ltd.
E.h.p. switchgear equipment for Whitton Street (£3,152).—British Thomson-Houston Co., Ltd.

Tilbury.—Urban Council. Accepted:—
Switchgear and transformers (£1,870).—Metropolitan-Vickers Electrical Co., Ltd.
Sub-stations and mains (£35,547).—Watshams, Ltd.

Weymouth.—Electricity Committee. Accepted:—
Supply and laying cables at housing estates (£2,176).—Johnson & Phillips, Ltd.

Forthcoming Events.

British Electrical Development Association.—Friday, March 18th. Royal Society of Arts, W.C.2. 7.30 p.m. "Refrigeration." Mr. N. E. Barber.

Association of Mining Electrical Engineers (North of England Branch).—Saturday, March 19th. Newcastle. 3 p.m. "Standardisation of Colliery Electrical Requisites." Mr. C. D. le Maistre.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, March 21st. 7 p.m. "Domestic Electrical Refrigeration." Mr. R. J. Mitchell.

(Mersey and North Wales (Liverpool) Centre).—Monday, March 21st. University, Liverpool. 7 p.m. "Illuminating Engineering," Mr. J. W. T. Walsh; and "Problems of Public Lighting by Electricity," Mr. H. T. Harrison.

(North-Midland Centre).—Tuesday, March 22nd. Hotel Metropole, Leeds. 7 p.m. Ordinary meeting.

(North-Western Centre).—Tuesday, March 22nd. Engineers' Club, Manchester. 7 p.m. "Notes on the 60,000-V Underground Network of the Union d'Electricité." Col. E. Mercier.

(East-Midland Sub-Centre).—Tuesday, March 22nd. Technical College, Derby. 6.45 p.m. "Powdered Fuel." Mr. G. H. Lake.

(Tees-Side Sub-Centre).—Monday, March 21st. Cleveland Technical Institute, Middlesbrough. 7 p.m. Ordinary meeting.

(South-Midland Students' Section).—Friday, March 18th. Annual joint meeting of the Graduates' and Students' Sections of the Institutions of Civil, Mechanical, and Electrical Engineers. Discussion: "That the Centralisation of Public Services is Desirable."

(Scottish Students' Section).—Wednesday, March 23rd. Royal Technical College, Glasgow. 7.30 p.m. Ordinary meeting.

(London Students' Section).—Friday, March 18th. Imperial Hotel, Russell Square, W.C. 7.15 for 7.30 p.m. Annual dinner.
Friday, March 25th. London. 6.15 p.m. "Electricity in the Works Laboratory." Mr. R. E. Snoxell.

Royal Society of Arts.—Monday, March 21st. 8 p.m. Cantor lecture. "Some Industrial Applications of Electrothermics." Mr. G. I. Finch.

Batti-Wallahs' Society.—Tuesday, March 22nd. Hotel Cecil. Annual dinner and dance.

Illuminating Engineering Society.—Tuesday, March 22nd. Lighting Service Bureau. 6.30 p.m. Discussion on "Problems in Illumination and Practical Solutions."

Royal Institution.—Tuesday, March 22nd. 5.15 p.m. "X-Rays and the Chemical Molecule." Dr. G. Shearer.
Saturday, March 26th. 3 p.m. "Alpha Rays and Atomic Structure." Sir Ernest Rutherford.

Institute of Wireless Technology.—Wednesday, March 23rd. Engineers' Club. 7 p.m. "Methods of Approximating the Reception Factor." by Mr. E. H. Turle.

Meter Engineers' Technical Association.—Thursday, March 24th. Lighting Service Bureau. 7 p.m. Annual general meeting. Discussion on "Queries and Problems."

Electrical Association for Women (South Wales and Monmouthshire Branch).—Thursday, March 24th. City Hall, Cardiff. 6.30 p.m. Inaugural meeting.

Birmingham Electric Club.—Friday, March 25th. Grand Hotel. 7 p.m. "Electricity Supply in the Midland Area." Mr. S. T. Allen.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, March 25th. Newcastle-on-Tyne. 6 p.m. "Pure Science." Sir Richard Glazebrook, F.R.S.

Physical Society.—Friday, March 25th. Imperial College of Science. 5 p.m. Ordinary meeting.

Electricity Supply Commercial Association (Great London Division).—Saturday, March 26th. Poland Rehearsal Rooms. 7.45 p.m. Dance.

Electrical Power Engineers' Association (Northern Division).—Saturday, March 26th. Midland Hotel, Manchester. 5.30 for 6 p.m. Annual dinner.

Notes.

Another X-Ray Martyr.

The *Daily Telegraph* reports that Dr. Dawson Turner, who was for twenty-nine years X-ray and radium expert at the Royal Infirmary, Edinburgh, and who is now living in retirement near Godalming, Surrey, has lost another finger owing to X-ray dermatitis. Early in his career Dr. Dawson Turner sustained severe burns, which eventually led to one of the fingers on his right hand being amputated. He is the inventor of a special tube which has added considerably to the efficiency of X-ray apparatus.

A Diesel-Electric Ship.

Scott's Shipbuilding and Engineering Co., Ltd., Greenock, has received from American owners an order for the hull of an oil-tank vessel of 12,500 tons, which will be propelled by Diesel-electric machinery. The electrical installation through which the power will be transmitted to the propellers will be provided by the British Thomson-Houston Co., Ltd., of Rugby, and all the machinery will be fitted on board at Greenock by the builders of the hull. The vessel will be the first constructed on the Clyde for propulsion by machinery of this type.

An Electric Sign Paradise.

According to Mr. Arthur Williams, of the New York Edison Company, in New York City's "Great White Way" there are 1,243,538 lamps in electric signs alone, aggregating 25,000,000 candle-power. More than 7 000 additional signs, containing 125,000 lamps, have been added to the skyline of Manhattan during the past two years. There are now 19,000 electric signs in use on Manhattan Island, south of 135th Street alone.

Electrical Aids in Fire Fighting.

A fire escape carrying, among other new features, a telephone, has been designed by Supt. Neal, of the Leicester Fire Brigade, and has been adopted by one of the principal firms supplying fire equipment. The escape has a ladder 85 feet long, to which, in addition to a pump working independently of any other machine (in itself a novelty), there is attached the telephone and a searchlight. The latter will enable firemen to see the character and quantity of the contents of any portion of a burning building that is not already involved. The telephone will be used for communicating with the firemen at the top of the escape during a fire. This is done at present by shouting, or by sending a messenger up and down the ladder. The first escape of the new pattern will probably be supplied to the Leicester Fire Brigade.

Testing Mining Gear.

Members of the Mining Institute of Scotland visited the Mile End works of Messrs. Mavor & Coulson, Ltd., Glasgow, on March 2nd, when special testing apparatus for ensuring that electrical mining gear will not endanger the safety of gas-infested underground workings was inspected. Formerly the gear manufactured by Messrs. Mavor & Coulson was sent to the Sheffield testing station, which is staffed by the University. Recently, however, the firm began experiments with apparatus to carry out safety tests in the works, and a satisfactory system has been evolved which enables them, as part of the routine, to test practically all their mining manufactures. The process consists of filling with a highly explosive gas mixture the explosion cover of the plant to be tested, and placing it in a sealed chamber flooded with an easily ignited gas mixture. The mixture under the cover is then electrically fired: if the cover is perfect it withstands the resulting explosion; if it is not, the surrounding explosive in the sealed chamber is ignited. In the event of the first explosion inside the cover not being followed by an explosion in the chamber, the gas mixture in the chamber is fired to ensure that its failure to explode was not due to its own composition. This ensures not only that the first test is sound, but also that the explosion cover of the plant is able to withstand explosion pressures outside as well as inside.

The visitors also saw demonstrations of new models of coal cutters and coal-conveyors manufactured by the firm. One of these models is a shaker conveyor, the height of which is only 16 inches, thus enabling it to be operated easily in a minimum seam of 18 inches.

Transmission Line Regulation.

The Westinghouse Electric Co., U.S.A., announces the acquisition of patents covering an invention by a San Francisco electric engineer, Mr. Frank Baum, by which he hopes to make possible the transmission of electric power over distances of 500 to 1,000 miles from the main power sources without the development of erratic voltage conditions. At a cost not exceeding 20 per cent. above the original outlay it is estimated that the capacity of any long line can be increased 75 per cent. According to *The Times*, Mr. Baum's invention provides for the "connection of a plurality of automatically regulated synchronous condensers at uniformly spaced distances to high-voltage transmission lines," thereby converting a long line into a series of short lines, in each of which the factors causing voltage instability can be corrected, for example, by auxiliary power from steam plant.

Fatality.

Leading-Aircraftman Dobbs, of the Royal Air Force, whilst carrying out the first test of "balloon-jumping" in this country near the Stag Lane Aerodrome, Hendon, came in contact with an overhead electric wire and received a fatal electric shock.

Electric Vehicles in the United States.

An electric truck handbook for 1927, with route maps, ferry time-tables, and other useful hints for owners and operators of electric trucks and commercial transportation men generally, has been issued by the Automobile Bureau of the New York Edison Company. This book makes it an easy matter for operators to ascertain the nearest electric truck garage in the New York Metropolitan District, and, besides full instructions covering the charging of truck batteries, contains much necessary information in a condensed form, including tables of charging rates for storage batteries and typical monthly garage rates in New York City, as well as lists of manufacturers. It is distributed by the Edison Company, free of charge. A similar publication would be useful in this country.

Lighting Unit Tests.

The correct design of the bowl or globe for enclosed lighting units is of supreme importance for obtaining the required diffusion and distribution of light, and in this connection a series of tests recently carried out by the Illuminating Engineering Department of the Edison Swan Electric Co., Ltd., is of particular interest. The tests were undertaken with the object of determining the distribution of light from the firm's "Swanlite" enclosed glassware units; the results of the tests are illustrated in graph form in fig. 1. Two fittings, each equipped with 200-W gasfilled lamps were mounted at a height of 9 ft. above the working plane; the spacing between units was 12 ft., and the intensity of light from each was measured at distances of 1 ft. from points immediately under them. The respective curves are illustrated at A and B, showing that in each case the maximum and minimum intensities were 5 and 1.25 foot-candles; the resultant illumination of the two units is indicated by curve C, which, had the fittings been spaced 11 ft. apart, would have been a straight line. Fig. 2 shows the "Swanlite" fitting, which is of the flat type, specially designed for the illumination of shops and stores where goods are displayed on counters and shelves.

A Skysign Rhapsody.

Marinetti, the Italian artist-poet and apostle of Futurism, who has the Shavian gift of shaking people out of conventional ruts and shocking them into thinking twice, has burst into rhapsodies on the triumph of electric light over the powers of darkness. In an open letter to Mussolini, he pleads that skysigns be not abolished from the great square that lies at the bases of the majestic buttresses of the Cathedral of Milan. Marinetti's prose loses its clanging precision in translation, but here is the sense of his panegyric to brilliant light:—

Traditional Critics of the Traditional Schools really think that the æsthetic qualities of the Piazza del Duomo di Milano will be safeguarded by abolishing illuminated signs! Ignoring the preoccupation of certain believers who know how to pray only in darkness and who do not see God in the divine electric light that to-day reigns in all the churches of Europe, I come forward to proclaim that illuminated signs in general, and those of the Piazza del Duomo in particular, constitute indispensable beauty.

No need for Futurist genius to see in illuminated signs our ardent evening prayer to the sun that it may soon return to warm the life of the world!

Illuminated signs are the sane sober optimism that one obstinately opposes to the desperation of gloom.

Illuminated signs are the gay flowers, the ripe fruits, the dancing nymphs of the new Futuristic æsthetics of speedy ferro- and bold concrete.

Illuminated signs are hygienic salvation. They are the denigration of sickly twilight, of nostalgic moonlight, and of the stars full of depressing melancholy.

They are our artificial constellations, daughters of our implacable will: lively, portable constellations to console us for those beyond our reach.

Illuminated signs are the profound scientific, industrial and commercial dynamism of the city—displayed on the rooftops to rival the dynamism of the stars.

Beautiful with a new but secure beauty, they answer the noblest and most crying of our needs—the curtailment of our submission to the half-death of dreams and night.

A Brazilian Development.

The Brazilian newspapers announce that the Cia. Brasileira de Energia Electrica, of Rio de Janeiro, which supplies electricity for light and power to the town of Bahia and the surrounding district, intends greatly to enlarge its power station in Bananeiras on the Paraguassú. A sum of £750,000 is mentioned as the expenditure on these extensions, which would apparently entail the doubling of the present capital of the company. When the additional plant is installed, there will be eight turbines in operation instead of three as at present, each machine being of 5,200 h.p. capacity. With the completion of this scheme, the lighting system of the town can be developed, more power can be placed at the disposal of the tramways and local industries, while extensions of the telephone installation, both local and trunk, are also contemplated.

B.E.S.A. Publication.

The British Engineering Standards Association has recently issued an addition to the B.S.S. for Insulated Annealed Copper Conductors for Electric Power and Light (No. 7-1926). This consists of data relative to a twin flexible cord, the conductors of which are insulated with pure and vulcanised india-rubber, twisted together and sheathed overall with tough-rubber compound. This flexible cord is intended for use only with pendant electric light fittings on voltages up to 250 V. The flexible is new only in the sense that it is provided with a coating of cab-tire sheathing. The details are given on an addendum slip which will be issued with all copies of specification No. 7-1926 sold in future. Those already in possession of the specification can obtain a copy of the slip free of charge by sending a stamped envelope to the Publications Department, British Engineering Standards Association, 28, Victoria Street, London, S.W.1.

The George Montefiore Prize.

The triennial international prize competition of the "Fondation George Montefiore" for 1926 has had to be postponed until this year; the prize amounts to 20,500 fr., and is awarded for the best original work submitted on the scientific progress and the technical applications of electricity in all its branches. Essays must be in French or English. The last date for them to be received is April 30th, 1927. Particulars regarding the conditions to be observed can be obtained from the general secretary, Association des Ingénieurs électriciens sortis de l'Institut électrotechnique Montefiore, 31, Rue Saint Gilles, Liége, Belgium.

Service Notes.

The Air Council has decided to increase the number of prize cadetships offered for competition annually from three to twelve. These cadetships enable boys to complete the two years' course at the R.A.F. Cadet College, Cranwell, at a cost of only £40 in all to their parents. Particulars can be obtained from the Secretary, Air Ministry, London, W.C.2.

Electricity Works in Austria.

From *Elektrotechnik und Maschinenbau*, of Vienna, we have received a copy of the "Statistics of the Austrian Electricity Works and Electric Railways" for 1926, issued by the Elektrotechnische Verein of Vienna in co-operation with the Verband der Elektrizitätswerke—the first to appear after several years' intermission. It is a volume of 214 pages, differing notably from its predecessors. Its contents are divided into five sections, which are respectively an alphabetical index of electricity works; statistics of works of 20-kW capacity and upwards; particulars of the prime movers of all works over 500 kW in size; statistical data of electric railways; and a series of summary tables of data.

From the tables it is seen that the total plant installed has a capacity of 772,770 kW, in 457 stations, nearly the whole of which is a.c., the d.c. plant amounting to 8,160 kW in 98 works; 22 other works, however, supply three-phase and direct current, their aggregate capacity being 37,550 kW. From 322 stations, with 601,800 kW of plant, three-phase only is supplied. Sixteen stations have plant installed in excess of 10,000 kW, totalling 512,400 kW, and 14 fall between 5,000 and 10,000 kW, aggregating 99,770 kW.

The average size of station is 1,700 kW. Most of the power is derived from waterfalls, on which 325 stations depend entirely, with 517,830 h.p.; 61 use water and steam or oil, and 20 use steam alone, aggregating 227,830 h.p.

The supply pressures, output, prices, &c., are given very fully; the pressures appear to be as various as in this country, and several frequencies are in use, but 50 cycles is by far the most common.

The volume is well produced and contains a large amount of information.

A New Dutch Association.

With the object of developing the use of electricity in Holland a new association, known as the Central Electrotechnische Commissie, has recently been formed at Eindhoven. The new body is composed of representatives of the Dutch Association of Electricity Station Managers, the electrical section of the Dutch Metallurgical Association, the Electrobond, the Association of Directors of Electricity Supply Undertakings, the Dutch Association of Electrotechnical Employers and the Dutch Association of Electrotechnical Wholesalers.

Electrical Power in Ports and Harbours.

In a paper under the above title, by Mr. W. A. Perry, recently read before the Institution of Engineers and Shipbuilders in Scotland, the author shows clearly the advantages of electrical over other forms of power for operating the various equipment and conveyances required at the docks for loading and unloading. Naturally, much attention is given to electric cranes, and the various types are dealt with separately, with regard to the duties performed by each. The various methods of supplying travelling cranes are discussed in detail, and the relative merits and disadvantages of each are put forward. The different cabling systems suitable for harbour work are also considered, as well as the motor and control equipment. In supporting the electric crane from the economical point of view, the author estimates the annual running costs for a steam crane, suitable for handling 150,000 tons per year, at £1,340. The costs for an electric crane suitable for the same work he puts at £850.

American Distribution Practice.

Changes in the transmission and distribution system of the Brooklyn Edison Company during the past four years are briefly described in the January issue of the A.I.E.E. *Journal*, mention being made of the effect of the changes on the system's efficiency. In 1927 a low-voltage, a.c. network will be installed and extended to care for the load growth until it becomes the principal supply system for low-voltage energy in Brooklyn. The plan of development is described in detail, the unique features claimed being: First, a suitably designed network unit consisting of a three-phase, 500-kVA, low-loss transformer, with an automatic network circuit-breaker mounted in the low-voltage pothead of the transformer. Secondly, the operation of the high-voltage feeders without regulators, at 27,000 volts, direct from the generating station. Thirdly, the ultimate plan of interlacing the high-voltage feeders to reduce the overload on transformers and to maintain good voltage regulation with one feeder out of service, and to pick up overload in areas of different load characteristics to obtain the advantage of diversity. It is shown that this plan of development ensures better service to the customer from every point of view, makes for safer working conditions on the system, results in general system improvement and involves less total investment, as well as a considerable reduction in losses and operating costs. The appendices describe tests made to determine whether arcing and short-circuit faults in the network will be self-clearing, the permissible voltage fluctuations on incandescent lamps, and the dissipation of heat from transformer vaults.

Italian Electrical Associations.

Hitherto there have been two electrical engineering associations in Italy—the A.E.I.E. and the A.N.I.E.I. It is now reported from Rome that an amalgamation has been effected of the two bodies, which will in future be known as the Unione Nazionale Industrie Elettriche. Signors S. E. Volpi and G. Ponti have been elected as the first honorary and acting presidents, respectively.

A Helium-Oxygen Atmosphere for Divers.

The use of a mixture of helium and oxygen in place of air for breathing in deep diving and other high-pressure work is reported by the Bureau of Mines, U.S.A., to result in greater speed of recovery from exposure to the high pressure, and in freedom from the suffering and danger due to "bends"—*i.e.*, the excessive absorption of nitrogen by the blood. Writing to *Science* of January 14th, Dr. Elihu Thomson, who was recently awarded the Faraday Medal by the Council of the Institution of Electrical Engineers, points out that he investigated the inhalation of mixed gases in 1873, and in 1919, when helium gas appeared to be available in quantity, he wrote to Dr. W. R. Whitney, of the Research Laboratory, General Electric Company, Schenectady, suggesting the use of helium and oxygen for respiration, as a means of extending the limit of depth attainable by divers. He also wrote to the Bureau of Mines in the hope of obtaining helium, but did not get any. A further letter was sent to Dr. J. C. McLennan, of the University of Toronto, in January, 1920, explaining his proposition, and the latter drew attention to the suggestion in *Nature*. Dr. Thomson complains that no acknowledgment of his priority of invention has been made by the Bureau of Mines. It was reported that the sunken submarine S-51 was raised by divers using this method.

Appointments Vacant.

Five engineering draughtsmen for H.M. Office of Works. Salesman (£200) for the Corporation of Hastings Electricity Department. Chief electrical engineer for Synthetic Ammonia and Nitrates, Ltd. Switchboard attendant for the Norwich Corporation Electricity Department. Cable jointer for the Venezuela Telephone and Electrical Appliances Co., Ltd. Junior technical officers for the Admiralty Experimental Establishment. Costing clerk (£200) for the Borough of Great Yarmouth Electricity Department. Shift engineer for the Bedford Corporation Electricity Department. Chief engineer for the Bombay Electric Supply and Tramways Co., Ltd. (Rs. 2,100 per month). Shift charge engineer (£390) for the Croydon Electricity Department. Scientific officer for research for the Air Ministry (£504). Three district mains engineers (£366) for the Hackney Borough Council Electricity Department. Relief shift charge engineer for the Beckenham Urban District Council Electricity Department. Clerk of the works for the Seaham Harbour Electricity Department. (See our advertisement pages to-day.)

Lecture.

Water Power.—Speaking at the annual meeting of the Aberdeen Chamber of Commerce, Prof. Blackadder, of the Chair of Engineering at Aberdeen University, dealt with the water power in the north of Scotland. It had been computed that in this country there was about 900,000 h.p. which had some possibility of being reasonably developed in an economical manner, of which about 200,000 h.p. had been developed. In Scotland about 270,000 continuous h.p. was available which might be developed economically. Some of it was being developed by the Lochaber and Grampian schemes. Round about the Aberdeen district there were ten sources of power of the first rank for commercial development. Among them were Loch Skene, Loch Kinord, and Loch Muick (which had been surveyed), also Loch Einach and Loch Morlich, in the Cairngorms. Together, they were estimated to yield about 2,720 continuous horse-power, while the electricity station at Aberdeen was of 30,000 to 40,000 horse-power. That gave an idea of how little there really was compared with what seemed to the ordinary man to be the large amount available.

Tennis-Court Lighting.

Real tennis, which is one of the oldest ball games in the world, still has many enthusiastic adherents, and endeavours are being made to re-establish it as a national game. One of its ardent advocates is Capt. MacLean, whose famous court at Rusthall House, Tunbridge Wells, was first designed in 1884. In order that play may be possible at any hour, after a series of tests 12 1,000-watt Osram gasfilled lamps have been installed in the ceiling; they are mounted in special dispersive reflectors, and shielded so that players when facing the net are not affected by the brightness of the inner edge of the reflector. The scheme was designed by the General Electric Co., Ltd., and was carried out by Messrs. Fredk. Hayden, Ltd., of Tunbridge Wells. The system employed provides an average uniform intensity of light of the order of 25 foot-candles, as compared with an average daylight intensity of approximately 53 foot-candles at floor level; the maximum reading is 28.6 foot-candles, and the minimum 18.3 foot-candles. Daylight readings revealed a maximum of 91.8 and a minimum of 23.1 foot-candles, showing a disparity in light intensity of as much as 68.7 foot-candles between one part of the court and another, while the greatest disparity in illumination by artificial light is only 10.3 foot-candles.

Ex-British Westinghouse Reunion.

On March 11th, at the Hotel Cecil, London, Mr. Leslie R. Morshead presided at the ninth annual reunion of ex-British Westinghouse men. Mr. J. D. Allan proposed "The Association," and seized the opportunity to recall many humorous incidents of the days gone by. Mr. Morshead, in reply, was able to hold his own in his genial way. He remarked that the Association now had over 400 members, and said that it was probably unique in the electrical industry in that it was representative of every branch of the business. Later he submitted the "Silent Toast" to the memory of all those members who had passed away and particularly to the three who died during the past year, Messrs. T. Dagnall, R. C. Rogers, and J. Nasmith. The entertainment side of the reunion was this year enlivened by community singing. The usual ballot held for life membership of the Association was won by Mr. H. B. Tilley. The proceedings went with a swing from the start, and the evening generally was voted one of the best that had been held. We understand that the committee is making arrangements for the tenth reunion to be held next year at the Hotel Cecil, London, which is to be of a special character, as a "Milestone" occasion.

Free State Electricity Bill.

An Electricity Supply Bill, supplementary to the original Shannon Bill, introduced in the Free State Dail recently, aims at giving to the State complete control, not merely of the Shannon power system, but of all electricity concerns in the State. Provision is made for the constitution of a Board of Control, and it is proposed to allocate a sum not exceeding £3,100,000 for the acquisition, when necessary, of existing electrical undertakings. The necessary finances for the Board are to be provided from the Central Fund by the Free State Ministry of Finance, by way of loan, which must be repaid, principal and interest, in such fashion as the Ministry requires. The Bill defines the general duty of the Board as follows:—To operate the Shannon works; to maintain them to distribute, utilise and sell electricity generated by the Shannon; and to control, co-ordinate and improve the supply, distribution and sale of electricity in the Free State. The measure provides that all charges made by the Board for electricity supplied after December 31st, 1932, must be such that the total revenue derived in any year will meet all the expenses of the administration in that year, and also provide for interest, sinking fund renewals, depreciation, &c. Six months after the passing of the Bill no person can sell electricity except under licence from the Board: *a*, as a "permit" revokable at will by the Board, and *b*, as a licence constituting him an "authorised undertaker" and undertaker" and giving him the powers now enjoyed by a "statutory undertaker." The Bill provides that the Board of Control may compulsorily acquire any electricity undertaking and itself operate it, but it must indemnify the former owner from all debts and liabilities owned by him on account of the undertaking. Provision is also made for the Board to fix the retail prices for electricity to be charged to consumers by any undertaker, and, if an undertaker objects to the charges, he can compel the Board to buy him out or to operate his business for him under terms laid down in the Bill. The Board can close generating stations or may require an undertaking to alter the type of current or the frequency or pressure of supply. This provision is designed apparently to secure standardisation of supply. A schedule to the Bill sets out the method of reckoning the compensation of persons who suffer loss of employment by reason of the closing down of a generating station.

Electrical Association for Women.

The fourth evening lecture arranged by the E.A.W. for women demonstrators and domestic science mistresses was given at the E.L.M.A. Lighting Service Bureau, London, on March 9th by Miss Margaret Partridge, B.Sc. With the aid of a few lampholders, pieces of flex, a screwdriver, and a pair of pliers, Miss Partridge kept her large audience interested for over an hour, showing how simple household repairs could be effected.

The lecture on March 23rd will be given by Mr. Morton, of Kelvinators, Ltd., on "Electric Power Appliances in the Home."

Extra-High-Pressure Cable Discharges.

In reply to inquiries that we made, we have received the following additional particulars from Mr. D. P. Sayers regarding the phenomena described in his letter on p. 370 of our March 4th issue:—In one case the cable was 0.15-sq. in., 3-core, paper-insulated and lead-covered (no earth sheaths), 11-kV working pressure, and wire armoured with one layer of jute under and over the armour wires. The cable was laid direct in the ground for a distance of five or six miles, and each end was terminated in a switch cubicle, the tails being bolted to isolators. The terminal box at one end had a copper bond bolted to a main earthing strip running throughout the cubicle-type switchboard, and the box was bonded to the cable with a brass gland wiped to the lead. The cable was tested at about 30 kV, direct current, obtained from a spark rectification set, and after it had been discharged, a copper strip was bolted across the three bottom isolator blocks and to the main earthing strip. There was no question that the lead, armour, and cores were efficiently earthed, as this end was handled without any effects, and it was not until an hour or so afterwards that a shock was obtained from the cores at the other end of the line.

Another case occurred with one of three single-core cables, paper-insulated, lead-covered, 0.2-sq. in. section, built for a working pressure of 33 kV to earth. About 660 yards of this cable was laid in ducts or troughing alongside the permanent way of a railway, and was then tested at about 140 kV with a Delon set. The cable sheath, together with the frame of the testing set, was earthed to the rails by means of a special clip made for the purpose, and the extra precaution had been taken of connecting a copper band to a near-by water main. After the test, the lead sheath was beaten down on to the copper core and plumbed over, and subsequently during the same process at the other end of the line, a shock was obtained.

Low-Temperature Carbonisation.

In a publication under the above heading of the Department of Scientific and Industrial Research, Fuel Research Technical Paper No. 17, price 6d. net, a preliminary account is given of the construction and behaviour of the latest vertical cast-iron retorts erected at the Fuel Research Station of the Department for the low-temperature carbonisation of bituminous coal.

A French Science Meeting.

A four-days' meeting of the French Association for the Advancement of Science is to be held in Algiers from April 13th to 16th next. M. Miramont de la Roquette, of that city, has been appointed chairman of the Electrical Section of the Conference.

Standard Transport Cost Sheet.

For some time past the Electric Vehicle Committee of Great Britain has been designing and compiling a standard form of cost sheet for owners of electric vehicles, in particular, though the sheet produced can be used in connection with other types of transport, and therefore forms a ready means of obtaining a fair comparison of working costs. The accurate determination of such costs is most important to every business concern; it will enable the user to see at a glance how his money is spent on transport, and to ascertain quickly which system is the most economical under his own particular working conditions. Copies of the cost sheet are obtainable from the British Electrical Development Association, 15, Savoy Street, London, W.C.2, price 1s. 3d. per dozen, or 10s. per hundred, postage extra.

Institution Notes.

Institution of Electrical Engineers.

INFORMAL MEETING.—At the informal meeting, on March 7th, Lt.-Col. K. Edgcumbe was in the chair, when Capt. P. P. Eckersley opened a discussion on "Wireless as a Factor in World Communication"; sketching the history of broadcasting, he reviewed apparatus of the past, paying a special tribute to the work of Hughes, who developed the first coherer. He said arc transmission was no doubt a robust engineering job, which accounted for the fact that there were more arc stations now in existence than any others. He emphasised his view that the true function of broadcasting was its use for communication where no better means were available; and that its object was not merely to provide a weak reflection of theatrical or concert entertainment. He believed there was an enormous future for wireless communication operating during the dull hours on a deferred-letter basis, but anticipated a breathing space of fifteen or twenty years before television need be considered as a candidate for a few wave-lengths.

Diesel Engine Users' Association.

At the March meeting of the Association a paper by Mr. P. A. Holliday on "High-Revolution Oil Engines" was read. The author referred to the satisfactory working results of heavy-oil plant in the power stations of the Southend-on-Sea Corporation, ex-submarine engines which had been converted for land use. He said it was difficult to determine the source of prejudice which undoubtedly existed in some quarters against high-revolution engines running on heavy oil. If revolutions, particularly those of the four-cycle, single-acting engines, were to remain at the old level, where must one look for progress? Viewing the possibilities of progress in electricity generating sets for land and sea, it was reasonable to expect some reduction in weight and occupied space; it had not yet been determined to what extent it would be possible to carry the high-revolution engine design into larger powers.

The Institute of Metals.

The annual general meeting of the Institute of Metals was held in London on March 9th and 10th, and amongst the numerous papers presented were those mentioned below:—

A paper entitled the "Investigation of the Effects of Impurities on Copper: Part V—The Effect of Bismuth on Copper," by Prof. D. Hanson, D.Sc., and Grace W. Ford, B.Sc. (Teddington), describes experiments made on copper containing up to 0.1 per cent. of bismuth, and the effects of small quantities of bismuth on the casting, hot- and cold-rolling, mechanical properties, electrical conductivity, and microstructure of copper. They confirm the great embrittling effect of bismuth, and indicate that when more than a trace of bismuth alone is present in copper the working properties, particularly the cold-working properties, are seriously affected; the solid solubility of bismuth in copper has also been investigated.

In Part III—"The Effect of Arsenic on Copper," Prof. D. Hanson, D.Sc. (Birmingham), and C. B. Marryat, B.Sc. (Teddington), describe investigations into the effects of arsenic on a series of alloys containing up to 1 per cent. of arsenic. Part IV deals with a similar series of tests on copper containing up to 2 per cent. of arsenic and 0.1 per cent. of oxygen, with a view to ascertaining the influence of each of these elements on the presence of the other. Experiments on the gassing of copper by hydrogen have also been undertaken. The effect of arsenic on the conductivity of the metal is very profound; it is much greater than the effect of oxygen and iron, and is such that arsenic should be excluded as rigidly as possible from high-conductivity copper. The impurity appears to reduce the crystal size in castings, but this effect is not appreciable in worked and annealed material. It was found that with copper containing oxygen in addition to arsenic little difference in the electrical conductivity was observed.

A paper on "Electric Furnaces in Non-Ferrous Metallurgy," by D. F. Campbell, M.A., A.R.S.M. (London), deals in a practical way with the principal electric furnaces now used for melting alloys of copper, nickel, zinc, and silver, with special reference to induction furnaces of normal and high frequency.

A paper on "The Mechanism of Inverse Segregation in Alloys" contains an appendix on "The Accurate Determination of Copper in Bronze by Electrolysis," by R. A. F. Hammond, B.Sc., A.R.C.Sc., A.I.C. (Woolwich).

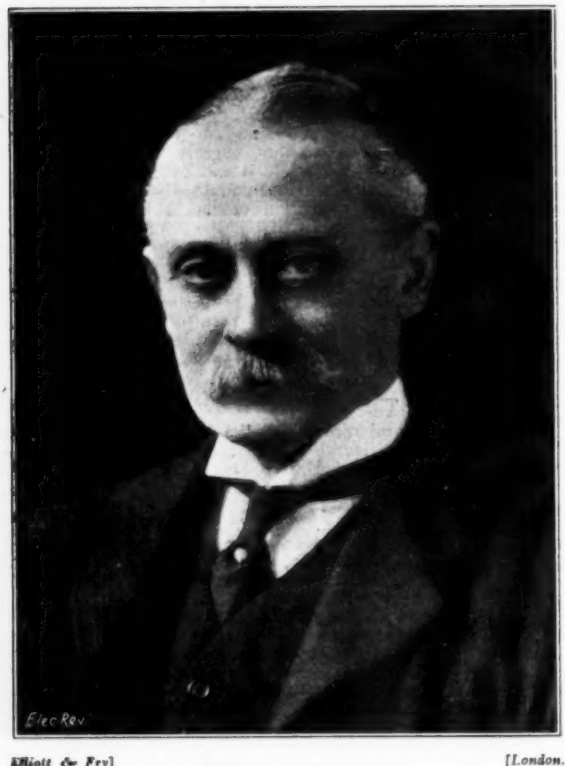
A paper on "Magnetic Analysis as a Means of Studying the Structure of Non-Magnetic Alloys," by Prof. K. Honda, Sc.D. (Sendai, Japan), and Prof. H. Endo, M.Sc. (Sendai, Japan), shows by means of examples that magnetic analysis applied to the case of non-magnetic elements, which are paramagnetic or diamagnetic, affords a very convenient method of studying the equilibrium diagram for the alloys consisting of these elements. Not only is the melting, or transformation, point of an element given by a sharp discontinuity of the susceptibility-temperature curve, but the liquidus and the solidus of an alloy are also marked by a sharp break, or bend, in the same curve; in some cases, small solubility is marked by a very large abrupt diminution of the diamagnetic susceptibility of one component on adding a small quantity of the other. Magnetic analysis is also a very convenient method for the study of the actual state of an alloy when above its melting point, that is, in detecting the existence of an intermetallic compound in the liquid phase, the degree of dissociation of the compound with the rise of temperature, &c.

The Council reported that the membership had grown to 1,801. Research had been made during the year into problems connected with the corrosion and protection of condenser tubes, and had resulted in a simple explanation being found for a number of actual cases of corrosion.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

At a meeting of the Grand Council of the Federation of British Industries on March 9th, LORD GAINFORD, P.C., D.L., was nominated as president-elect of the Federation in succession to Sir Max Muspratt, Bt. Lord Gainford's



Elliott & Fry [*London.*

Lord Gainford, P.C., D.L.,
President-elect of the F.B.I.

activities lie mainly in the direction of collieries; he is a director (and vice-chairman) of Pease & Partners, Ltd., and many other colliery companies. To electrical men he is known as a director of the County of London Electric Supply Co., Ltd., while he is familiar to the public as vice-chairman of the British Broadcasting Corporation. Apart from his industrial experience, Lord Gainford has had a long career in the public service. In 1889 he was Mayor of Darlington, and he subsequently sat in Parliament for about 14 years. He has held the posts of President of the Board of Education and Postmaster-General, among other appointments. During the war he served on the Claims Commission in France and Italy.

MR. J. H. TONGE, M.I.E.E., consulting engineer, has been elected president of the Rotary Club at Preston. Prior to his retirement at the end of 1922, Mr. Tonge was for 30 years managing engineer of the Preston electricity undertaking, most of the time for the National Electric Supply Co., Ltd.

MR. R. C. HARRIS, electrical manager for Messrs. Clarke, Chapman & Co., Ltd., of Gateshead-on-Tyne, who has been with the firm for 20 years, is resigning his position and is taking up agencies in the N.E. Coast area.

Leeds Corporation Tramways Committee recommends increasing the salary of Mr. W. CHAMBERLAIN, the general manager and chief engineer, from £1,500 to £1,600 per annum.

The *Financial Times* states that Mr. W. HIGGINS, chairman of the Pernambuco Tramways and Power Co., recently left for Brazil, accompanied by the secretary, Mr. H. HARPER, in order to visit the company's properties in Pernambuco.

MR. JAMES A. ERSKINE, a graduate of the Royal Technical College, Glasgow, has received an appointment in the electrical engineering department of the Monongahela Coal Operators' Association, Virginia, U.S.A. He has had experience of mines in Scotland and Canada.

We congratulate Mr. FRANCIS C. POLDEN, the well-known City electrical contractor, upon his election to the Court of Common Council of the City of London as a representative of the Vintry Ward.

Mr. F. J. CLEVELAND has given up his position as chief technical assistant to Messrs. J. S. Withers & Spooner, and has opened an office as a patent agent at Bank Chambers, 29, Southampton Buildings, Chancery Lane, W.C.2.

The new chairman of the London County Council is Mr J. M. GATTI, managing director of the Charing Cross Electricity Supply Co., Ltd.

The paragraph in our last issue relating to the salary of the Southport borough electrical engineer was incorrect. We understand that no increase of Mr. MOXON'S salary has been under consideration.

Obituary.—MR. A. C. FORSHAW.—The death took place on March 9th at Stockport of Mr. Alfred Christian Forshaw, who was for many years with the Direct United States Cable Co., first in Liverpool and later in London, where he was general manager of the Metropolitan office. He was 80 years of age.

ALD. E. B. SMITH.—The death was announced last week of Alderman Edward Bremner Smith, J.P., chairman of the Oswestry Electric Lighting Co.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Synchronola Radio Co., Ltd.—Private company. Registered March 2nd. Capital, £400 in 317 ordinary shares of £1 each and 1,660 deferred shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in the high-frequency radio transformer invented by W. & F. Butterworth, and to register the name "Synchronola" as a trade mark to be applied to this transformer. The permanent directors are:—W. Butterworth (chairman), 39, Bottom-o'-th'-Moor, Chorley Old Road, Bolton: F. Butterworth (managing director), 150, Brownlow Road, Horwich; Dr. B. Rai, Duff House, Horwich. Qualification of first directors: one share; of other directors, 150 ordinary shares. Remuneration as fixed by the company. Registered office: 150, Brownlow Road, Horwich, near Bolton.

Alpha Electric Welding Co., Ltd.—Private company. Registered March 7th. Capital, £1,000 in £1 shares. Objects: To acquire the business of boiler repairers and general engineers, &c., carried on as "The Alpha Electric and Oxy-Acetylene Welding Co., Ltd.," at Newport, Mon., and at Swansea, Glam. The subscribers (each with one share) are:—F. A. Saunders, 55, Lambert Street, Newport, Mon., accountant; F. Finnett, Chaseley, Alteryn Avenue, Newport, Mon., clerk. The first directors are to be appointed by the company or subscribers. Qualification, £25 shares. Remuneration as fixed by the company. Secretary: F. A. Saunders, 55, Lambert Street, Newport, Mon.

Strouds (Bellingham), Ltd.—Private company. Registered March 5th. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, electrical, radio and mechanical engineers, manufacturers of and dealers in all apparatus used in connection with wireless telephony, &c. The first directors are:—Mrs. Ethel E. Stroud (chairman), 4, Farmfield Road, Downham, Bromley, Kent; C. J. Turner, 64, Simpsons Road, Bromley, Kent. Qualification: £1. Solicitors: Cohen, Dunn, Page & Moore, Audrey House, Ely Place, E.C.1. Registered office: Bellingham Station Buildings, Catford, S.E.

Winfield & Reeves, Ltd.—Private company. Registered March 5th. Capital, £200 in 1s. shares. Objects: To carry on business as manufacturers of electrical fittings and illuminated signs, metal workers, &c. The directors are:—R. C. Winfield, 11, Nelson Crescent, Ramsgate, electrical engineer; C. H. Morrell, 1, The Terrace, Champion Hill, S.E.5, accountant; E. J. Evershed, 60, The Ridgway, Wimbledon, S.W.19,

solicitor (managing director); W. G. Reeves, 160, Commercial Road, Peckham, S.E.15, electrical engineer. Secretary: C. H. Morrell. Solicitors and registered office: Helliwell, Harby and Evershed, 231, Strand, W.C.2.

J. Briggs Electrical Contractors, Ltd.—Private company. Registered March 10th. Capital, £5,000 in £1 shares. Objects: To acquire the business carried on at Golden Square, Regent Street, W., as "J. Briggs & Company," and to carry on the business of electrical engineers and contractors, &c. The directors are:—J. G. Briggs, "Dalkeith," Ickenham, Middlesex, electrical engineer (permanent chairman and managing director); C. V. Ramsey, 17, Church Lane, Hornsey, N.8, surveyor. Registered office: Grafton House, Golden Square, W.1.

Macilafone Co., Ltd.—Private company. Registered March 9th. Capital, £2,000 in 1,900 10 per cent. preference shares of £1 each and 2,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in all kinds of telephone appliances and parts thereof, &c. The subscribers (each with one £1 share) are:—E. McBean, 7, Avignon Road, Brockley, S.E.4, solicitor's clerk; J. G. Argold, 2, Dacre Gardens, Lee, S.E.13, solicitor's clerk. The first directors are to be appointed by the subscribers. Secretary (*pro tem.*): E. McBean. Solicitors: W. H. Speed and Co., 18, Sackville Street, Piccadilly, W.1. Registered office: Thanet House, 231, Strand, W.C.2.

Electro Trust, Ltd.—Public company. Registered March 11th, with a nominal capital of £300,000 in £1 shares (180,000 6 per cent. cumulative preference and 120,000 ordinary). The objects are to acquire and hold shares, stocks, debentures, debenture stock, bonds, obligations and securities issued or guaranteed by any company, constituted or carrying on business in Great Britain or elsewhere, and in particular by any company dealing in electric lighting, electrical appliances of all kinds, or any business relating to electricity, &c. The minimum cash subscription is seven shares. The subscribers (each with one ordinary share) are:—F. C. Howard, E. G. C. Jones, H. Quennell, A. J. Graham, A. M. Welsford, R. J. L. Scott, and G. T. Weeks, all solicitors, of 18, Austin Friars, E.C. The first directors (to number not less than three nor more than six) are to be appointed by the subscribers. Qualification, £250 shares or stock. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Nigerian Power and Tinfields, Ltd.—Public company. Registered March 10th. Capital, £100 in 5s. shares. The objects are to carry on in Nigeria or elsewhere the business of producers and suppliers of electric power, electricians, mechanical engineers and manufacturers, workers and dealers in electricity, motive power and light; to acquire or obtain control of mines, minerals, mineral and other properties, &c. The minimum cash subscription is seven shares. The subscribers (each with one share) are:—L. C. Walker, 79, St. George's Avenue, Tufnell Park, N.7, incorporated accountant; H. J. Guntay, "Langston," Riverhead, Kent, secretary to public company; R. S. Williams, 21, Ventnor Villas, Hove, Sussex, merchant; and four others. Qualification, 100 shares. Remuneration, £250 each per annum (chairman £300), free of income tax (but not super-tax), and a percentage of the profits. Solicitors: Birkbeck, Yeo & Co., Finsbury House, E.C.2. The registered office is at Finsbury Pavement House, E.C.2.

Official Returns of Electrical Companies.

North Metropolitan Power Station Co., Ltd.—Trust deed dated February 25th, 1927, to secure £850,000 debenture stock, charged on freehold land at Enfield, with buildings, plant and machinery thereon, rentals or other sums receivable by the company under an agreement dated October 5th, 1926, or under a lease dated February 2nd, 1927, and all rights and interest of the company therein and (as a floating charge) on the company's undertaking and other property, present and future, including uncalled capital. Trustees: Consolidated Trust, Ltd., Dashwood House, 69, Old Broad Street, E.C.2.

Pinnacle Switchgear, Ltd.—Satisfaction in full on February 28th, 1927, of debenture dated July 20th, 1926, securing £1,000. First debenture dated February 28th, 1927, to secure £3,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: T. M. Richards, 12, Kildare Gardens, W.2.

W. L. Gray, Ltd.—Particulars filed of £750 debentures, authorised February 2nd, 1927, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Beko Lamp Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated February 16th, 1927, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Temple Cox Research Co., Ltd.—Issue on February 14th, 1927, of £430 debentures, part of a series.

Joseph Evans & Sons (Wolverhampton), Ltd.—Satisfaction to the extent of £1,000 on February 28th, 1927, of debentures dated December 18th, 1907, securing £50,000.

International Wireless Manufacturers, Ltd.—H. Smith, of 4, York Buildings, Adelphi, W.C.2, ceased to act as receiver and manager on January 16th, 1927.

Natwirco, Ltd.—H. E. Burgess, Senior Official Receiver, of 33, Carey Street, W.C.2, was appointed receiver on March 2nd, 1927, under powers contained in debenture dated October 22nd, 1926.

City Notes.

County of London Electric Supply Co., Ltd.

The directors' report for the year ended December 31st last states that the amount available for distribution, including £24,098 brought forward, was £794,350. After meeting debenture interest, &c., transferring £28,975 to the contingency fund, and £190,679 to the depreciation reserve, there remains a balance of £466,541. An interim dividend at 5 per cent. was paid on 1,330,000 ordinary shares; it is proposed to pay a final dividend at 5 per cent. on 3,103,334 ordinary shares, leaving £51,374 to be carried forward. The net capital expenditure during the year was £1,326,185, of which £813,089 was accounted for by mains and £219,998 by buildings. The total capital expenditure now stands at £8,411,397. The amount of energy sold during the year was 145,714,062 kWh, as compared with 93,845,622 kWh in 1925; the number of consumers rose by 14,517 to over 84,500. The report makes mention of the capitalisation of reserves and the allotment of four new shares to each three ordinary shares held by the shareholders. During the year the company obtained a Special Order for the Merstham area, and the mains have now been extended to that area. A Bill is being promoted in the present session of Parliament for the extension of the company's powers and its area of supply in the County of Essex, and for other purposes. To deal with the increased load and prospective demands the company secured the Electricity Commissioners' consent to the completion of the first section of the Barking station, and the work was commenced in May last. The meeting is to be held on March 29th.

Liverpool Overhead Railway Co.

The annual meeting was held at Liverpool, on March 9th Mr. M. H. Maxwell presiding. The chairman said the past year had been full of difficulties to the board and the management, and the results were disappointing. Reductions in expenditure had been effected by changes in the staff, and the effect of that would be felt in the current year. Alluding to the tramway service, now discontinued, he said there had been written off £30,763 against tramways capital account, but apart from the tram shed and certain cables which were being used by the railway, the cars and equipment formerly in use would realise little more than scrap value. Competition with the Liverpool Corporation tramway system and the L.M. & S. Railway had to be reckoned with. The company could not raise its fares, and it was out of the question to reduce them to the level of the tramways. Negotiations had been continued with the Corporation, and it was thought possible that the company might be able to obtain a quotation for a supply of power on favourable terms, which would obviate a capital expenditure of about £13,000. At the same time, the directors were making investigations as to the advisability of installing a turbine set at the generating station, which would reduce the cost of generation. It was hoped that a new station just south of the new Gladstone Dock would be ready for traffic when the new dock was officially opened next July.

German Companies.

The *German-Atlantic Telegraph Co.*, Berlin, reports net profit and balance forward amounting to 152,000 marks, as against 13,000 marks in 1925; half is transferred to the reserve fund and the balance carried forward. It is mentioned that the Emden-Azores cable is now open to traffic, and a dividend is expected for the current year.

The *Elektra Co.*, Dresden, reports net profits of 1,385,000 marks for 1926, as against 1,231,000 marks in the previous year. It is proposed to pay a dividend of 12 per cent. on the share capital of 10,000,000 marks, as against 10 per cent. for 1925.

The *Saxony Works, Light and Power Co.*, Dresden-Niedersedlitz, states that, in spite of unfavourable conditions, the turnover during 1926 was approximately the same as in the preceding year. The net profits were 755,000 marks, and the dividend remains at 6 per cent.

Stock Exchange Notices.

Application has been made to the Committee to allow the following to be officially quoted :—

Adelaide Electric Supply Co.—250,000 6¼ per cent. "C" cumulative preference shares of £1 each, fully paid, Nos. 500,001 to 750,000.

Metropolitan Electric Supply Co.—500,000 ordinary shares of £1 each, fully paid, Nos. 1,000,001 to 1,500,000.

Yorkshire Electric Power Co.—773,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 830,001 to 1,603,000.

Dealings in the following have been specially allowed by the Committee under Rule 159 :—

Electrical Distribution of Yorkshire.—300,000 new ordinary shares of £1 each, issued at £1 5s. per share, partly paid and fully paid, Nos. 500,001 to 800,000.

Perak River Hydro-Electric Power.—331,237 ordinary shares of £1 each, fully paid, Nos. 1 to 331,237; £75,000 7 per cent. participating debenture stock.

Westminster Electric Supply Corporation, Ltd.

The report for 1926 is prefaced by a statement that the accounts have been prepared in accordance with the London Electricity (No. 2) Act, 1925, and are not comparable with those of previous years. The balance of net revenue for the year is £137,077, and from this are deducted interim dividends paid (1s. per share on ordinary), leaving £86,921. After meeting the balance of preference dividend it is proposed to pay a final dividend at the rate of £5 16s. per cent. on the ordinary shares and to carry forward £1,503. Sir A. B. W. Kennedy has retired from the post of engineer-in-chief, and he has been succeeded by Mr. P. L. Riviere. To fill the vacancy on the board thus caused and one due to the death of Mr. C. S. Gilman, Mr. W. A. Pearman (general manager) and Mr. D. M. Touche have been appointed directors. The capital account shows an expenditure of £179,704 since June 30th, 1925 principally upon mains. The amount of energy sold during the past year was 44,594,030 kWh. The meeting was to be held on Wednesday last.

Bristol Tramways and Carriage Co., Ltd.

The revenue for the past year amounted to £1,086,926 and the expenses to £985,267. With the balance brought forward, there is a net revenue of £107,073. After providing for debenture interest and preference dividend, it is proposed to transfer £10,000 to reserve for contingencies and renewals and to pay a final dividend of 4 per cent. on the ordinary shares, leaving £4,989 to be carried forward. The reserve fund now stands at £372 378. There were increases in the number of passengers carried and in the traffic revenue. The report records the death of Mr. J. H. Howell, a director, and states that Mr. S. E. Smith, C.B.E., manager for the last eight years, has been appointed to the board. The meeting was to be held yesterday (Thursday).

Hendon Electric Supply Co., Ltd.

After meeting debenture interest, preference and interim ordinary dividends, &c., for 1926, there remains a surplus of £31,749. Of this £5,726 is placed to general reserve, £5,000 to income-tax account, and £8,000 to repairs and renewals fund. A final dividend of 2s. per share, free of tax, is recommended on the ordinary shares, and after providing additional remuneration for directors, £2,014 is carried forward. The interim ordinary dividend was at the rate of 10 per cent., tax free. During the year an issue of 50,000 6 per cent. cumulative preference shares of £1 each was made, at the price of 20s. 6d. per share, and the premiums, totalling £1,285, have been transferred to general reserve. The meeting was to be held on Wednesday this week.

British Insulated Cables, Ltd.

The report for the year ended December 31st last records a profit of £607,853, to which is added £224 918 brought forward, making £832,771. After providing for debenture interest, preference dividend, interim ordinary dividend, &c., there remains £690,054, which it is proposed to allocate as follows :—Depreciation, £85,000; to reserve, £500 000; final dividend of 10 per cent. on the ordinary capital, making 15 per cent. for the year (£133,333); leaving £271,721 to be carried forward. The directors consider that in view of the difficult industrial conditions prevailing during the year under review, the results are satisfactory. They express their regret at the death of Sir J. S. Harmood Banner, Bt. (vice-chairman), who had been a director since 1902. The meeting is to be held on March 21st, at Liverpool.

Ericsson Telephones, Ltd.

A dividend of 8 per cent. is recommended on the ordinary shares. The dividend for 1925 was 16 per cent., and there was an issue of bonus shares.

Metropolitan Electric Supply Co., Ltd.

A final dividend at the rate of 12 per cent. per annum is recommended on the whole of the ordinary capital, making 8 per cent. for the year. This is equivalent to 12 per cent. on the old ordinary capital.

Imperial Tramways Co., Ltd.

The revenue account for 1926 shows that after paying the debenture interest and the interim preference dividend, there is an available balance of £12,452. Of this £3,814 is transferred to reserve for depreciation and contingencies, the balance of the preference dividend is paid, and a balance of £3,838 is carried forward. The company has received a dividend of 7 per cent. upon its holding of ordinary shares in the Bristol Tramways and Carriage Co., Ltd., but nothing has been received from the London and Suburban Traction Co., Ltd. The report records the death of Mr. J. H. Howell and the appointment of Mr. S. E. Smith, C.B.E., to fill his place on the board.

Waygood-Otis, Ltd.

The profit for the year ended December 31st last was £88,772, as compared with £45,180 for the last nine months of 1925. To this is added £17,428 brought forward, making £106,200. The reserve receives £45,000, £6,000 is transferred to the pensions fund, and after the payment of a final dividend of 7½ per cent. on the ordinary shares (making 10 per cent. for the year), £17,200 is carried forward. An equivalent dividend was paid in respect of 1925. A sum of £30,000 has been brought from the reserve for the purpose of writing down goodwill and patents to £30,000. The meeting was to be held on Wednesday last.

Bruce Peebles & Co., Ltd.

The report for 1926, which is to be presented at to-day's annual meeting, records a profit of £24,509, to which is added £8,656 brought forward, making £33,165. From this £5,000 is transferred to depreciation reserve, and after meeting the preference dividend, it is proposed to pay a dividend of 10 per cent. on the ordinary shares, leaving £6.812 to be carried forward. The separate factory for the production of transformers, which was mentioned in the last report, is now in full working order.

Midland Electric Corporation for Power Distribution, Ltd.

The net profit for the past year fell from £173,307 to £163,481. Adding £30,963 brought forward, there is an available balance of £194,444. After paying debenture interest, allocating £30,000 to depreciation and £50,000 to reserve, it is proposed to pay a final dividend of 2s. per share on the old ordinary shares (making 10 per cent. for the year as for 1925) and 1s. 4¼d. per share on the new shares, leaving £31,132 to be carried forward. In the previous year £40,000 was devoted to depreciation; the contribution to reserve was the same. Meeting: March 21st.

Ceara Tramway, Light and Power Co., Ltd.

Speaking at the recent annual meeting, the chairman (Mr. E. H. R. Trenow) said that in less than three years the company had been able to provide additional equipment to the value of over £50,000 without raising new capital. In the same period the debenture debt had been reduced from £309,000 to £252,000. During the last ten years there had been unbroken progress and the gross income had increased nearly four-fold. The directors asked for power to apply part of the balance of profit carried forward in the repayment of outstanding profit warrants and in payment of a dividend not exceeding 2½ per cent. on the ordinary shares. The report and accounts were adopted.

American Telephone and Telegraph Co.

The report for 1926 states that the total earnings were $197,910,965 and the net earnings $138,931,386. Interest absorbed $21,940,986, dividends $86,496,345, and contingency reserve $4,000,000, leaving $24,494,055, which has been carried to surplus. During the year 781,000 telephones were added to the system, making the total 17,574,000. The company's assets are valued at $3,256,000,000. The Bell System's accounts show total revenues of $823,216,735 and a net income of $155,061,019. Dividends took $100,614,437 and miscellaneous appropriations $5,048,000, leaving a balance of $49,398,582.

Marconi's Wireless Telegraph Co., Ltd.

At the annual meeting on Tuesday last the directors' proposals, which were outlined in our last issue, were adopted. A report of the meeting will appear in our next issue.

St. James' and Pall Mall Electric Light Co., Ltd.

The directors announce a final dividend of 1s. 3.2d. per share on the ordinary shares, making, with the interim payment, the standard dividend for the year in accordance with the London Electricity (No. 2) Act.

London Electric Supply Corporation, Ltd.

A final ordinary dividend of £5 11s. 5 1/7d. per cent. has been declared, making £8 8s. 6 6/7d. per cent. for the year.

Swiss Company.

The *Swiss Company for the Electrotechnical Industry*, Basle, proposes to pay a dividend of 8 per cent. on each of the three classes of shares for 1926, as in 1925.

Newcastle and District Electric Lighting Co., Ltd.

Although the prolonged coal stoppage last year adversely affected the company's business the net profit was slightly higher at £16,810, after providing for debenture interest, &c., and allowing £18,000 for depreciation (as against £20,000 in 1925). Adding £15,545 brought forward, there is an available balance of £32,355. As reported last week, it is proposed to pay a dividend of 7 per cent., leaving £15,555 to be carried forward. During the year mortgage debentures to the extent of £4,360 were redeemed and loans amounting to £2,973 were repaid. The meeting was to be held yesterday (Thursday).

City of London Electric Lighting Co., Ltd.

The directors recommend the payment of the balance of the preference dividends and a final dividend of 2s. per share on the ordinary shares, making 15 per cent. for the year. They have also decided to capitalise £400,000 of the company's reserves and to distribute to the ordinary shareholders 400,000 ordinary shares of £1 each, credited as fully paid, in the proportion of one such share for every two existing ordinary shares. These new shares will rank *pari passu* with the existing ordinary shares as from January 1st, 1927, and therefore will not participate in the above dividend.

Davis & Timmins, Ltd.

Out of a net profit of £3,747 for 1926, plus £24,588 brought forward, it is proposed to pay a final ordinary dividend at the rate of 10 per cent. per annum, making 8 per cent. for the year. £18,894 is carried forward. Messrs. J. Kerr-Bock and F. Le Neve Foster have been appointed to vacancies upon the board caused by the death of Sir Henry Mance and Mr. W. Negus. Last year's dividend on the ordinary shares was the same, but there was also a bonus of 17 per cent., free of tax.

Tees Power Station Co., Ltd.

The profit for the past year was £85,909, and after providing for debenture interest and reserve (£20,000), and adding £1,764 brought forward, there is available £37,799. It is proposed to pay a dividend of 3¾ per cent. (as for 1925) and to carry forward £2,062. The authorised share capital has been increased to £975,000 by the creation of 40,000 new £1 shares, and 20,000 of these have been allotted to the Newcastle-upon-Tyne Electric Supply Co., Ltd.

Telegraph Construction and Maintenance Co., Ltd.

The report for the past year shows a net profit of £125,910. Adding £105,852 brought forward, there is available £231,762. It is proposed to transfer £30,000 to reserve (making £330,000), to pay a final dividend of 7½ per cent., free of tax (making 10 per cent. for the year, as for 1925), and to carry forward £112,123. The meeting was to be held yesterday (Thursday).

W. Canning & Co., Ltd.

The profit for the year ended December 31st last was £41,336, and to it is added £4,228 brought forward, making £45,564. A dividend of 10 per cent., plus a bonus of 6d. per share, is recommended on the ordinary shares, £10,000 is transferred to reserve, and £1,000 is put to the employés' benevolent trust fund, leaving £4,564 to be carried forward.

Automatic Telephone Manufacturing Co., Ltd.

The profit for the past year was £161,497. It is proposed to allocate £40,000 to depreciation and £35,000 to general reserve, and after paying a final ordinary dividend of 6¼ per cent. (making 10 per cent., as in 1925), £59,851 is carried forward.

International Automatic Telephone Co., Ltd.

The report for 1926 shows a profit of £119,884 (against £109,522). It is proposed to pay a final dividend of 6¼ per cent. on the ordinary shares (making 10 per cent. as before), and a dividend of 10 per cent on the deferred shares (the same), leaving £38,583 to be carried forward.

Colombo Electric Tramways and Lighting Co., Ltd.

The Colombo correspondent of the *Financial Times* reports that the Ceylon Government has agreed to purchase the company's lighting and power undertaking for £245,000. The traction system, which is operated under a municipal concession, remains unaffected.

Radio Corporation of America.

The net profit for the past year was $7,367,100 (as compared with $5,737,206). Of this, $1,855,090 has been allocated to reserves for patents, &c., and $4,632,010 has been credited to surplus account. The current assets now exceed current liabilities by $19,167,824.

Pinchin, Johnson & Co., Ltd.

The net profit for 1926 was £148,339, as compared with £119,976 for 1925. The reserve receives £27,000 (as against £15,000), the ordinary dividend is maintained at 30 per cent., and £30,571 is carried forward.

Stewarts & Lloyds, Ltd.

A dividend of 2½ per cent. has been declared on the ordinary shares, as against 7½ per cent. last year.

County of Durham Electrical Power Distribution Co.

The report for 1926 shows a net profit of £34,477, and to this is added £2,242 brought forward, making £36,719. It is proposed to pay a dividend of 6¼ per cent. (as against 6 per cent. for 1925) on the ordinary shares and to carry forward £607. The meeting was to be held on Wednesday last.

Cammell Laird & Co., Ltd.

The directors report a loss of £73,575 for 1926, and are unable to recommend dividends on the preference or ordinary shares. The last ordinary dividend (5 per cent.) was paid in 1922.

English Electric Co., Ltd.

The directors state that they are unable to recommend the payment of the final dividend on the preference shares. The last ordinary dividend was 5 per cent. for 1924.

Hadfields, Ltd.

A dividend of 2½ per cent. has been declared on the ordinary shares, as against 3 per cent. for 1925.

Bogota Telephone Co., Ltd.

An interim dividend of 5 per cent. has been declared.

Stocks and Shares.

MONDAY EVENING.

WITH the Budget so near at hand, Stock Exchange markets are taking an active interest in its possibilities. The investment stocks and shares are vulnerable to fresh taxation proposals that fall directly upon incomes or estates. Faced with a probable deficit of at least 30 millions in respect of the current financial year, the Chancellor has to budget for a coming twelvemonth that should be free from such industrial disturbances as a general strike and a coal stoppage. Mr. Churchill has a reputation of readiness for the acceptance of sporting risks. The voices of authority proclaim that national trade is on the eve of pronounced revival. Taking these two considerations in conjunction, the Stock Exchange is disposed to look for no further direct taxation than that which may perhaps fall upon tobacco, foreign wines, and a few licence duties. Prices of investment stocks are therefore moderately steady, although business in such securities travels upon a narrow gauge.

The English Electric Company provided rather an unpleasant shock to equipment shares as a whole by passing the final dividend on its preference shares. The interim dividend was duly met last September. Of late the price of the ordinary—which shares have received nothing since 1s. in May, 1925—has shown a very dull tendency, but expectation had assumed the payment of the preference dividend this month, and the postponement came as a surprise. The shares are cumulative. On the week the price is 4s. down at 13s. 6d., and the ordinary dropped 2s. 6d. to 11s. 3d. Both classes of shares are difficult at present to sell.

Siemens gave way to 28s. 9d., and a dull tendency set in, but Metropolitan-Vickers gained 1s. to 29s. 3d., and General Electrics put on a few pence.

General Electric ordinary shares are the subject of a special recommendation by the First British Guaranty Trust, Ltd., in a weekly circular issued by this firm, who consider that an immediate purchase on three-monthly account should show very satisfactory results. The firm "confidently expect to see an advance in the shares from their present quotation of 32s. to £2 or over," between now and the issue of the report at the end of June. The G.E.C. paid 7½ per cent. last year, 6 per cent. for 1925, and the First British Guaranty Trust looks for 10 per cent. shortly. The last-named may not be an unreasonable, even if it is an optimistic, anticipation, but if it were to be fulfilled, £2 per share would look a high price, giving 5 per cent. on the money. Nothing is said in the advice as to whether the firm buy any shares in the Stock Exchange market if an investor accepts their offer to pay 20 per cent. of the purchase price (calculated upon the market value) now, with no further obligation to put up more money until the end of three months. The offer is not one that will commend itself to the prudence of the investor who likes to know that his shares have actually been purchased and that he has some tangible security given him in exchange for the 20 per cent. of the purchase price of the shares which he is asked to provide.

Further consideration is being given to the issues of the provincial power and supply undertakings. The Llanelly and District Electric Company pays no dividend for last year (ELECTRICAL REVIEW, p. 401), owing to the coal dispute, and the Fife Tramway, Light and Power Company has cut its dividend from 6 per cent. to 3 per cent. Nevertheless, the market is not a bad one. Lancashire Light and Power and Midland Counties are both harder. Electrical Distribution of Yorkshire ordinary are changing hands around 29s. The new shares, issued at 25s. in the proportion of three for five old shares, have become negotiable, the price being about 2s. 9d. premium. A fair demand for them has already developed.

Another dramatic rise in Brazilian Tractions, lifting the price 4 points to 132—last Friday it touched 134—is an outstanding feature of the markets. The preferred improved to 115. The persistent nature of the demand gives the buying an air of American inspiration. Most stocks and shares connected with Brazil have lately benefited by the hope that the country may resume, this year, the sinking fund for redemption of Brazilian bonds, and the Traction Company is declared to be doing very well. For shares in respect of 6 per cent. dividends to stand at 132 obviously requires special justification. Anglo-Argentine Trams are better, and the Mexican Utility group is still moving in favour of stockholders. A rally of 4 in British Columbia Electric Railway deferred stock, after the continuous dwindling in the price, attests the impression that the fall had gone far enough to render the stock an attractive investment. Private advices from Vancouver go to show that British Columbia is participating in the more prosperous conditions which have returned to Canada. Singapore Trams strengthened to 10s.

British Electric Traction ordinary stock remains at 145½; if it were to be quoted amongst trust companies' stocks, as it should be, the price would probably stand higher. A steady advance in the ordinary and deferred issues of the trust group is one of the minor features of present-day markets, but B.E.T. is still included amongst "Tramway and Omnibus" descriptions in the Stock Exchange Official List. There is only a limited market in the stock; its price of 145½ looks high; but, as a lock-up investment, it deserves inclusion in any well-chosen list of holdings for probable appreciation in value.

Notable strength is shown by Districts, where the price quoted ex dividend last week is 3 points up at 60½. Metropolitan Consolidated has strengthened to 64, and Underground £1 shares are the centre of lively animation at their advanced price of 16s. 3d. London Electric ordinary is 2 points harder at 60½ ex dividend. A rise of 1½ lifted London United Tramways 4 per cent. debenture to 51, and the preference rose to 5s. 6d. London and Suburban Traction preference put on a few pence at 7s. Metropolitan Electric Tramways 4½ per cent. debenture is 2 up at 65½.

Marconis present a better aspect than they have done for some time past. The price touched 17s. and then reacted a trifle. This week's meeting is expected to give the board the necessary majority for passing the directors' resolutions. These latter met with vigorous opposition from the English Shareholders' Committee, but the board has received support, both strong and influential. If the official recommendations are carried, the outlook for the Marconi Company is promising, and an early return of dividends seems to be reasonably assured. Marconi Marines are 9d. higher at 23s. 3d., and Canadian Marconis strengthened to 4s. The meeting on Tuesday in this week was expected to prove a lively affair.

Several interesting reports have made their appearance during the past few days. The County of London Electric Supply had a net revenue for 1926 of £770,250, being nearly £47,000 higher than the 1925 figures. The company paid an interim dividend of 5 per cent. and a final at the same rate, the latter on the capital that had been increased by £1,770,000 by the capitalisation of reserves and distribution of these in the shape of ordinary shares, the price of which is better at 28s. The Westminster Electric Supply Corporation's net revenue of £137,000 is £35,000 less than that of 1925. The total dividend on the ordinary shares for 1926 took £110,800, against £113,300 required for the payment of 3s. a share on the ordinary in 1925. The Charing Cross Electricity Supply Company makes up its standard dividend for the year in accordance with the London Electricity No. 2 Act.

The County of Durham Electrical Power Distribution is paying 6¼ per cent. on the ordinary shares, against 6 per cent. a year ago. The Telegraph Construction and Maintenance Company increased its profit last year, but the dividend is retained at 10 per cent., tax free. British Insulated Cables made a gross profit of £607,900 last year, which goes against £670,300 for the previous twelve months. The dividend of 15 per cent. is repeated. This time, however, there is much more capital than there was a year ago. The Midland Electric Corporation for Power Distribution reports a net profit of £163,500, being about £10,000 lower than that made in the corresponding period. The ordinary dividend of 15 per cent. is maintained, with the addition of 1s. 4¼d. per share on the new shares. India Rubber preference eased off to 15s.

Automatic Telephones are dull at 53s. 3d. sellers, the previous dividend of 10 per cent. being repeated. The net profit of £161,500 is £1,800 down as compared with 1925. International Telephones keep steady at 43s. for the deferred. Dividends of 10 per cent. on these and on the ordinary are declared. Bogota Telephones at 31s. 3d. have acquired a small rise upon declaration of a 5 per cent. interim dividend. Monte Video Telephones at 35s. and United River Plates at 8¾ are both better than they have been. The cable group is lacking in features.

St. Maurice preference are good at 20s. South Wales Power 6½ per cent. preference rose to 17s. 6d. The rubber share market is not quite so good as it was last week. Business has fallen off to some extent. Engineering shares hold their ground, but iron and steel descriptions manifest a disposition to droop for want of public interest.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Dividend. 1924.	1925.	Price Mar. 14 1927.	Rise or fall.	Yield p.c.
	£					
Bournemouth and Poole	1	14	14	60/9	—	4 12 0
Brompton Ordinary	1	10	10	25/-	—	5 12 0
Charing Cross Ordinary	1	15	15	25/6	—	5 9 10
do. do. ½ Pref.	1	4½	4½	17/-	—	5 6 0
Chelsea	1	12	12	25/-	—	5 12 0
City of London	1	15	15	2½	—	... ...
do. do. 6% Pref.	1	6	6	22/-	—	5 4 4
Clyde Valley	1	8	8	30/-	—	5 6 8
County of London	1	15	15	25/-	+6d	5 9 0
do. do. 6% Pref.	1	6	6	22/-	—	5 4 4
Edmundson's Ordinary	1	7	8	26/3	—	6 2 0
do. 7% Pref.	1	6	7	22/-	—	6 1 9
Elec. Supply Corporation	1	10	10	20/6	—	5 11 1
Kensington Ordinary	1	15	15	24/6	—	5 14 8
Lancs. Light and Power	1	7½	7½	5/-	+6d	6 0 0
London Electric	1	10	10	24/-	—	5 17 8
do. do. 6% Pref.	1	6	6	5½	—	5 10 4
Metropolitan	1	11	11	27/6	—	5 9 10
do. 4½% Pref.	1	4½	4½	17/-	—	5 2 10
Midland Counties	1	6½	6	22/-xd	+1/-	5 9 0
Newcastle-on-Tyne Ordinary	1	7	7	22/-	—	6 7 8
do. 5% Pref.	1	5	5	17/6	—	5 14 8
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	17½	25 6	—	5 9 10
South London	1	15	15	24/6	—	5 8 0
South Metropolitan Pref.	1	7	7	1¼	—	6 8 0
Urban Ordinary	1	4	7	25/6	—	5 9 10
do. 6% Pref.	1	6	6	20/6	—	5 17 1
Westminster Ordinary	1	15	15	25 6	—	5 12 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/6	—	7 6 4
Yorkshire Elec.	1	8	8	29/6	—	5 8 4

Home Rails.

Central London Ord. Assented	Stock	4	4	70	—	5 14 4
Metropolitan	,,	5	5	64	+½	4 19 9
do. District	,,	3½	3½	61	+1½	5 14 9
Underground Electric	£1	Nil	Nil	16/3	+3d	1 17 0
do. do. Income	Bonds	6	6	101	—	*5 18 10

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	100	—	6 0 0
do. Def.	,,	1½	1½	25½	—	6 6 0
Automatic Telephone	1	8	10	53/3	—	3 15 3
Chili Telephone	5	5	6	6½	—	4 19 4
Cuba Sub. Ord.	10	5	5	6¾	—¼	7 8 2
Eastern Extension	10	10	10	17½	—	*5 18 4
Eastern Tel. Ord.	Stock	10	10	172½	—	*5 16 0
Globe Tel. and T. Ord.	10	10	10	18½	—	*5 8 1
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	22	20	26½	—	7 10 0
Indo-European	25	8½	10	46½	—	*5 7 6
Marconi	1	10	Nil	16/3	+1/3	...
Marconi-Marine	1	10	7½	23/4	+9	6 9 0
Oriental Telephone Ord.	1	12	12	53/3	+8/9	4 12 0
United R. Plate Tel.	5	8	8	8¾	—	*4 11 5
Western Telegraph	10	10	10	17	—	*5 17 8

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref.	5	5½	5½	8¼	+⅛	8 9 2
do. do. 2nd Pref.	5	6	6	3½	+⅛	9 4 6
do. do. 5% Deb.	Stock	5	5	71½	—	7 0 0
British Electric Traction Ord.	,,	7	8	145½	—	5 10 0
do. do. 6% Pref.	,,	6	6	109	—	5 10 1
Brazil Traction	100	4	5	132	+4	4 11 0
Brit. Columbia Elec. Ry. Pcc.	Stock	5	5	89½	—	5 11 9
do. do. Preferred	,,	96/-	186/9	116½	—	*5 7 6
do. do. Deferred	,,	129/5	8	156	+4	*5 1 3
do. do. Deb.	,,	4½	4½	79½xd	—	5 7 9
London & Sub. Trac. 5% Pref.	1	2½	Nil	7/-	—	Nil
London United Tram. Deb.	Stock	4	4		+1½	7 16 10
Mexico Trams, 5% Bonds	—	5	5		½	+1 6 18 0
Mexican Light Common	100	Nil	Nil	45	+2	Nil
do. Pref.	100	Nil	Nil	97½	+1	Nil
do. 1st Bonds	—	5	5	71½	+1	6 19 10
Yorkshire (West Riding)	1	8	—	8/9	—	... ...

Manufacturing Companies.

Babcock & Wilcox	1	12	12	23/6	—	4 19 1
British Aluminium Ord.	1	5	10	47 6	+6d	4 4 2
British Elec. Transformer Pref.	1	Nil	7	18/9	—	7 12 8
British Insulated Ord.	1	15	15	64/9	—	4 7 3
Brush Ord.	1	10	10	29 3	—	7 1 7
Callenders	1	15	15	3½	—	4 5 9
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 8
Crompton Ord.	1	Nil	Nil	10/-	—	... ...
Edison-Swan	4/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	85	—	5 17 8
Electric Construction	1	10	10	31/3	—	6 8 0
Enfield Cable Pref.	1	7½	7½	1¼	—	6 6 4
English Electric	1	5	Nil	11 3	—2/6	... ...
do. do. Pref.	1	6	6	13/6	—4/-	... ...
Gen. Elec. Pref.	1	6½	6½	22/6	—	5 10 4
do. Ord.	1	5	7½	31/3	+3d	4 16 0
Henley	1	16	20	39/3	—	4 9 8
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	5	5	1	—	*5 0 0
Johnson & Phillips	1	10	17½	9½	—	6 10 1
Met.-Vickers Ord.	1	8	8	29/3	+1/-	5 9 5
do. Pref.	9	8	8	4	—	5 18 4
Siemens Ord.	1	7½	7½	28/9	—9d	5 4 4
Telegraph Construction	15	20	10	22½	—	*4 0 0

* Dividends paid free of Income Tax

U.S.A. Electrical Exports.

Figures for 1925 and 1926 compared.

BELOW are shown the values of electrical machinery and apparatus exported from the United States during the 12 months ended December last. Comparative figures for the year 1925 are added, and notes of increases or decreases are also given :—

	1925. Thousands.	1926. Thousands.	Inc. or dec. Thousands.
	$	$	$
Electrical machinery and apparatus (total)	73,790	84,226	+10,436
Generators—			
Direct current—			
Under 500 kW	848	960	+ 112
500 kW and over	428	455	+ 27
Alternating current—			
Under 2,000 kVA	303	188	− 115
2,000 kVA and over... ...	1,901	1,273	− 628
Steam turbine generator sets	796	1,412	+ 616
Accessories and parts for generators	1,089	920	− 169
Self-contained lighting outfits	1,076	1,151	+ 75
Batteries—			
Flashlight batteries	1,214	1,674	+ 460
Other primary batteries ...	1,204	2,020	+ 816
Storage batteries	2,683	3,443	+ 760
Transforming or converting apparatus—			
Power transformers	2,175	2,231	+ 56
Other transformers	1,315	1,266	− 49
Rectifiers, double-current, and motor generators, dynamotors, synchronous, and other convertors ...	967	1,557	+ 590
Transmission and distribution apparatus—			
Switchboard panels, except telephone	2,305	2,193	− 112
Switches and circuit breakers over 10 A	2,424	2,618	+ 194
Fuses and fuse blocks ...	343	352	+ 9
Watt-hour and other measuring meters	447	493	+ 46
Volt, watt and ampere meters and other recording, indicating and testing apparatus	1,696	2,152	+ 456
Lightning arrestors, choke coils, reactors and other protective devices	707	709	+ 2
Motors, starters, and controllers—			
Motors under 1 h.p.	2,102	1,200	− 902
Stationary motors—			
1 to 200 h.p.	2,472	3,207	+ 735
Over 200 h.p.	604	884	+ 280
Railway motors	808	1,127	+ 319
Electric locomotives—			
Railway	482	1,842	+1,360
Mining and industrial ...	331	759	+ 428
Starting and controlling equipment			
For industrial motors ...	1,159	1,395	+ 236
For electric railway and vehicle motors	278	203	− 75
Accessories and parts for motors	2,040	2,181	+ 141
Electrical appliances—			
Electric fans	917	948	+ 31
Electric lamps—			
Metal filament	1,250	1,603*	+ 353
Other electric lamps	244	281	+ 37
Flashlights	1,342	2,058	+ 716
Searchlights and projectors	562	574	+ 12
Motor-driven household devices	1,206	1,744	+ 538
Domestic heating and cooking devices	1,340	1,722	+ 382
Industrial electric furnaces and ovens	252	253	+ 1
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, &c. ...	1,415	1,178	− 63
Telephone apparatus—			
Magneto telephones	125	105	− 20
Other telephones	498	332	− 166
Telephone switchboards ...	799	2,219	+1,420
Other telephone equipment ...	2,298	2,468	+ 170
Railway signals, switches, and attachments	803	505	− 298
Bells, buzzers, annunciators and alarms	171	296	+ 125
Signal and communication devices—			
Radio apparatus	9,904	8,794†	−1,110
Telegraph apparatus	497	1,018	+ 521
Other electrical apparatus—			
Spark plugs, magnetos, and other ignition apparatus ...	2,708	1,904	− 804
Insulating material	1,545	1,380	− 165
Metal conduit, outlet, and switch boxes	797	1,164	+ 367
Sockets, receptacles and lighting switches	1,595	1,718	+ 123
Electric lighting fixtures, interior and street	1,314	1,860	+ 546
Other wiring supplies and line material	1,132	1,164	+ 32
Other electrical apparatus ...	6,883	7,423	+ 540
The following, not included in the total of electrical apparatus, were also exported :—			
Insulated iron or steel wire or cable	268	276	+ 8
Insulated copper wire or cable	4,900	4,816	− 84

* These were distributed as follows :—Europe, $61,000; Canada, $16,000; Central America, $79,000; Mexico, $267,000; British West Indies, $26,000; Cuba, $184,000; Argentina, $205,000; Chile, $116,000; other South American countries, $202,000; Australia, $188,000; New Zealand, $43,000; British South Africa, $44,000; other countries, $116,000.

† Included in 1926: Transmitting sets and parts, $556,000; Receiving sets, $2,874,000; Valves, $868,000; Receiving set components, $2,016,000; Receiving set accessories, $2,481,000.

Indian Electrical Imports.

THE Trade Commissioner at Calcutta (Mr. D. M. Clarke) has forwarded to the Department of Overseas Trade a survey of the import trade of India during the period from April 1st to December 31st, 1926.

In the course of this it is stated that the imports of electrical machinery were valued at Rs. 173 lakhs, as compared with Rs. 147 lakhs in the corresponding period of 1925. Boiler imports are given as 50 lakhs, against 73. In electrical machinery the United Kingdom imports increased from 120 lakhs to 140 lakhs, and those from the United States from 11 lakhs to 16½ lakhs. The majority of the boilers were from the United Kingdom, her imports during the two corresponding periods of 1925 and 1926 being 65 lakhs and 48 lakhs respectively. With regard to other electrical goods, the position is shown in the following table :—

	1925-26. Rs. lakhs.	1926-27. Rs. lakhs.
Electric fans and parts	19	22
Electric wires and cables (rubber insulated)	30	23½
Electric wires and cables (other)	14½	20½
Bare copper wire (electrolytic) (other than telegraph and telephone wires)	11½	14
Telegraph and telephone instruments ...	5½	2½
Electric lamps and parts	14½	14½
Electric lamps (other sorts)	3	9
Electric lamps (parts and accessories) ...	2	6½
Batteries	7	7½
Accumulators	8½	11
Electric lighting accessories and fittings ...	13	11
Electric meters	5	4
Electrical instruments, other sorts	3½	2½
Switchboards	2½	3
Electrical goods and apparatus not enumerated	25½	28
Wireless apparatus	5	4

The increase in the imports of electric fans is due to increased shipments from the United Kingdom, whose share rose from 11½ lakhs to 14½ lakhs. In electric wires and cables the United Kingdom supplied 21¾ lakhs. Of the trade in electric wires and cables, insulations other than rubber, the United Kingdom supplied 90 per cent. of the imports. In bare copper wire 10½ lakhs came from the United Kingdom; the United States provided the majority of the remainder, a portion of it being in connection with the electrification of the Bombay, Baroda and Central India Railway. Of the 2½ lakhs for telegraph and telephone instruments, over 2 lakhs came from the United Kingdom. In electric lamps, the United Kingdom's imports increased to 5½ lakhs; the Netherlands supplied the second largest total, 5 lakhs. In electric lamps, other sorts, the United States supplied over 7½ lakhs, the United Kingdom's share being only ½ lakh. The United Kingdom's share of batteries was 2½ lakhs, and the United States' 3½ lakhs. Of the import of accumulators, 90 per cent. came from the United Kingdom. In electric lighting accessories and fittings, the United Kingdom supplied 7½ lakhs and Germany 2½ lakhs. In meters the United Kingdom supplied 3½ lakhs, 85 per cent. of the total imports. Practically all the switchboards came from the United Kingdom. Of wireless apparatus the United Kingdom supplied 3½ lakhs.

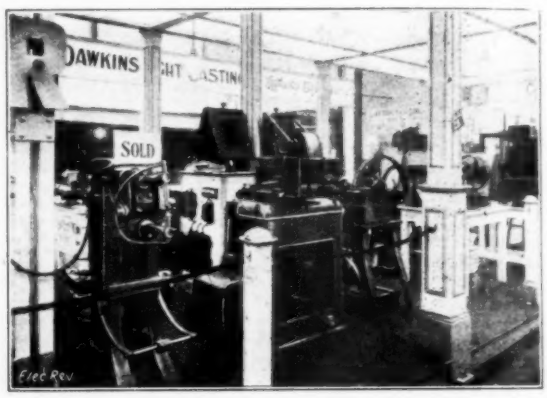
The British Industries Fair.—V.

Exhibits at Birmingham.

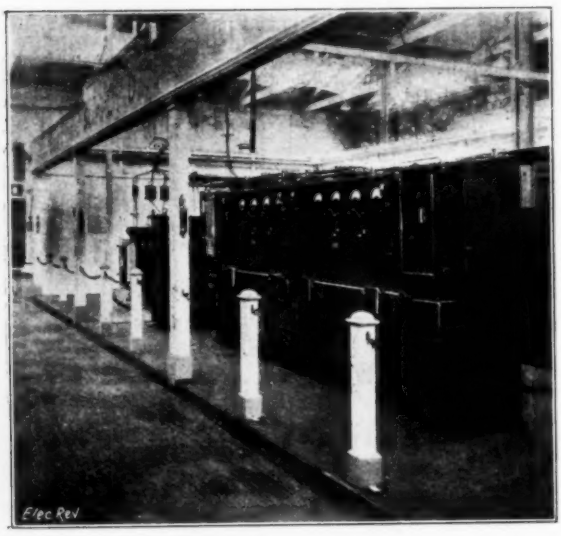
IN this issue we conclude our notes upon the Birmingham section of the British Industries Fair, and in doing so reproduce photographs of the stands of two regular exhibitors.

The first three views show the display of the Birmingham Corporation Electric Supply Department, which was bigger than ever this year. The first picture is a general view of the exhibit which comprised all kinds of domestic and industrial appliances. The second illustration shows welding plant, representing the industrial section. The third view is of a separate stand upon which a working sub-station was erected

The Birmingham Corporation's Stand—Domestic End.



The Birmingham Corporation's Stand—Industrial Plant.



The Corporation's Sub-Station.

Display by Premier Electric Heaters, Ltd.

for dealing with the Fair electricity supply; here are seen the control panels of the 460-kW mercury-arc rectifier sub-station and part of the bank of three 100-kW transformers. Apart from being an interesting exhibit in itself, the sub-station served a useful purpose in supplying energy to the exhibitors, whose requirements now exceed the capacity of the plant installed by the Fair authorities for the purpose of lighting the building and demonstrating machinery, &c.

The other illustration shows the comprehensive nature of the domestic appliance exhibit arranged by Premier Electric Heaters, Ltd. This, too, surpassed the company's previous efforts, and was a very bright and stimulating display.

Electric Transmission, Ltd.

This exhibit was divided into three groups, which readily represented the company's products. These were overhead transmission line material: transformer terminals; and outdoor pole-top switchgear. All the porcelain shown by the company was manufactured by Messrs. Taylor, Tunnicliffe & Co., Ltd. In the first group, pin and cap and pin-type insulators used on overhead construction were shown. The pin-type insulators are fixed to their spindles through a neat thimble, which ensures that the porcelain will not be subjected to the internal expansion stresses produced on the materials by variations of temperature. The spindle head has a specially rounded thread to obviate damaging the thimble on the one hand, and the creation of corona, due to sharp points within the porcelain hole, on the other. The cap and pin-type insulators have also been expressly designed to protect the porcelain against expansion stresses, and they can be used for the highest voltages. For heavy mechanical loadings strain insulators are supplied with a clamp, which is suitable both for copper and aluminium steel core conductors. In the second group two specific designs were shown: All-porcelain terminals for voltages up to 33 kV, and condenser-type terminals for voltages from 33 to 66 kV. The condenser-type terminal is a joint product of the company and Micanite and Insulators Co., Ltd. No compound is used in the air-filled terminals, but nevertheless corona is neither apparent or audible until voltages well above the working pressure have been reached. The terminals are guaranteed hot-oil tight. The condenser-type terminals are noticeable for the small amount of compound used, the porcelains being specially manufactured to ensure a close joint between the paxolin—the upper portion of which is cylindrical—and the porcelain. The condenser-type terminal is also hot-oil tight, its puncture value being exceedingly high. In the outdoor pole-top switch-

gear group there were three chief exhibits: rod-operated isolating switches, remote-control isolating switches, and air-break switches. The rod-operated isolating switches have a springless main locking device, which prevents the blade opening under the influence of electro-magnetic forces. The remote-control isolating switches incorporate a square operating bar instead of the conventional tube, this ensuring positive and simultaneous movement of the blades, and the operating mechanism is adjustable. The operating mechanism of the air-break switch is similar to that of the remote-control isolating apparatus. The blades are opened by means of rocking insulators, thus eliminating any torsional stresses between the porcelain and the pin. The rocking insulator is connected to the blade by means of a link combination, which imparts a rapid movement to the blade; an ice-breaking mechanism is also incorporated.

George Nobbs, Ltd.

On this stand was exhibited a range of the latest models of the instantaneous-type water geysers as designed to meet the I.E.E. regulations. In these a separate switch and water valve are provided for fitting, particularly in the case of the bath geyser, in a position out of reach of persons standing in the bath. The larger sizes are built for medium voltages divided into two equal circuits and for three-wire d.c. up to 600 V, or they may be divided into approximately three equal circuits with a triple-pole switch for three-phase working. An interesting line displayed was the "Genii P.S." water heater, which has been designed for use in places where a geyser is not practicable. The water valve is fitted on the cold-water side of the heater, for which the makers claim many advantages, the principal of which is that the heater cannot be subjected to the pressure of the water mains. No air or steam vent is necessary, neither can any steam pressure be set up in the tank. The tank is of light construction and fitted with a loose cover. It is supplied in various sizes to give any hot-water storage capacity. An exhibit of special interest was the "Genii" electric urn for boiling water. This is designed for use in bars, canteens, hairdressers' and other places where a constant supply of hot water is required. It is strongly made and finished, constructed of copper, polished outside and tinned inside. A lever draw-off tap, a top cover, lifting handles, and immersion heater loading with 98 per cent. efficiency are fitted. Somewhat similar are the "Genii" jar-lined urn and the "Genii" rectangular-type water boiler for fixing to a wall or bulkhead. Other exhibits included the "Genii" electric hot-water radiator and the "Genii" electric hot-water towel rail and rack. The latter has been constructed to meet the demand for a low-priced article, and is made in two standard designs and lengths. The first has a solid crystal rod with nickel-plated brass end brackets and a nickel-plated tubular heater 24 in. in length. The second is of similar design, only 36 in. in length. Both may be safely used on the ordinary electric light circuit, the consumption being very low.

Bromford Tube Co., Ltd.

This company exhibited a range representing all classes of weldless steel tubes from 10-in. bore down to ¾ in. in lengths up to about 45 ft. Of interest were the specimens of metallised tubing, a process for coating tubes both inside and out, the thickness of the coating being anything between a few thousandths and 1/16th of an inch.

Henry Wiggin & Co., Ltd.

Many types of wire were shown upon this stand, and element wires for electric fires were given prominence by being shown in use in "Creda" and "Belling" fires.

British Electrical Repairs, Ltd.

Examples of re-wound electrical machinery formed the bulk of this exhibit. Commutators, armatures, field coils, &c., were shown.

Ad-Shades, Ltd.

A large collection of art shades (silk, parchment, and composition) was exhibited by this company. All of these reached a very high standard of design.

Mersey Cable Co., Ltd.

Disposed about this stand were a number of drums bearing samples of the company's cables, in addition to sections and lengths of wires and cables upon showboards.

Porcelain Electrical Fittings Association.

This Association had a large combined stand upon which were displayed porcelain electrical parts of all kinds made by its members.

Wilkins & Wright, Ltd.

Numerous examples of brassware for electric lighting were shown by this company, including canopies, chains, bowl rings, &c. In addition, complete radio sets ("Utility") and components were displayed. The latter included triple condensers, micrometer dials, plugs and jacks, &c.

P.I.V. Gear Syndicate, Ltd.

Upon this stand were exhibited examples of drives incorporating the company's positive infinitely variable gear. In essence this gear comprises two cones upon a shaft, which can be moved towards or away from each other. The inner faces of these cones slope inwards towards the centre and are radially slotted. A special form of belt employed has steel slatts running transversely through the links, and these engage with the slots in the pulley cones, giving a positive drive. A simple arrangement is provided for moving the cones so gradually as to give an almost imperceptible change of speed.

Lea Recorder Co., Ltd.

Among this company's exhibits were "V"-notch recorders for boiler-feed water and condensate. "Cubi-meters" for measuring coal were also on view. These embody an adaptation of the "V"-notch principle, but in the place of a float a swinging door is fitted to operate the recording mechanism, and the flow of water is replaced by an endless belt which conveys the coal through the aperture beneath the door. When the flow of coal ceases the door falls and cuts out the recording mechanism.

Bull Motors, Ltd.

The main exhibit upon this stand was a portable arc-welding set consisting of a motor-generator and switchboard mounted on a trolley. The design of the generator eliminates wasteful resistances in the arc circuit, and it is claimed that the standard 25/200-A set takes only 8 h.p. when loaded to its maximum. Other exhibits were a 2,400-V a.c. generator for marine radio transmission and examples of the company's industrial motors. A collection of photographs indicated the range of the company's activities, which include the manufacture of valve filament lighting dynamos, trolley 'bus motors, 1,000-cycle, single-phase alternators for radio purposes, organ-blowing equipment, &c.

Upon the same stand appeared a new "Brookhirst" combined motor switch and controller and an "Airedale" star-delta starter.

Premier Electric Heaters, Ltd.

This company, as usual, had an excellent display of its fires and domestic appliances. All of these were notable for their excellent finish in addition to their working qualities. Fires, irons, urns, kettles, saucepans, hot-plates, and small cooking apparatus formed the bulk of the exhibit. Special interest was displayed by visitors in the company's safety device for electric kettles and similar apparatus. This consists of a metal bridge which is maintained across the contacts in the bottom of the kettle by a nut fitted with a split sleeve. This sleeve becomes overheated when the kettle boils dry and falls apart allowing the bridge to fall and break the circuit. A new sleeve can be fitted in a few moments.

Lightfoot Refrigeration Co., Ltd.

The examples of its work shown by the company were an "Ellarcold" automatic refrigerator in operation cooling a cabinet of 20 cu. ft. capacity; and another set combined with an ice-making tank. The latter plant is driven by a 1-h.p. motor, and is capable of operating an 800 cu. ft. capacity chill room.

May & Padmore, Ltd.

Among the electric fires shown was a new imitation coal fire fitted with two 1,000-W bars in the front, and finished in oxidised silver. There were also a number of bowl fires and soldering irons, and a new curling-tong heater.

Estler Bros.

This firm showed typical low-voltage electric furnaces for industrial processes requiring temperatures up to 1,100 deg. C. In these is incorporated a transformer which reduces the pressure to between 3 to 6 V, and the elements, instead of being fine wires as usual, are of heavy sheet steel, ensuring better distribution of heat and longer life. The furnaces can be fitted with automatic heat control.

Castle Fuse and Engineering Co., Ltd.

The exhibit of this company comprised a range of eight "Triumph" fuses for currents of from 5 to 300 A. These can be arranged for switchboard mounting or fitted into iron cases. The company also showed various examples of fuse unit assemblies from small distribution boards to heavy triple-pole ironclad boxes for industrial service.

Thos. De La Rue & Co., Ltd.

Upon this stand were shown numerous examples of moulded insulating material, including fireproof articles.

Other Exhibitors.

In addition to those firms which we have mentioned in this and previous issues there were a number of exhibitors who showed one or two electrical or allied items. Such were the Stainless Iron and Alloys Co., Ltd. (electric fires and an electric cooker in stainless iron); John Harper & Co., Ltd. (electric heater); James Smellie, Ltd. (lighting fittings); A. Bell & Co., Ltd. (electric fire); Scupham & Wood, Ltd. (wooden electrical accessories); Mond (Staffordshire) Refining Co., Ltd. (joint box compounds); Ryder & Davidson (small geared motors); C. & J. Swingler (bowl chains and fittings); Davis & Timmins, Ltd. (screws and terminals); Joshua Buckton & Co., Ltd. (armature balancing machine); the Silglas Co. (shades); Phillips & Day, Ltd. (lighting standards); and Smalls, Ltd. (mica products).

Illuminating Engineering.

Conditions governing good lighting: some street-lighting problems.

(Résumé of Proceedings before the INSTITUTION OF ELECTRICAL ENGINEERS.)

(Concluded from page 412.)

AT the ordinary meeting of the Institution of Electrical Engineers on March 3rd, two papers relative to the above-named subject were presented. An abstract of Mr. J. W. T. Walsh's paper, together with a report of the discussion on both, was published in our issue of March 11th. The other paper is dealt with below.

Public Lighting.—*(Abstract.)*

By Lieut.-Com. HAYDN T. HARRISON, R.N.V.R., M.I.E.E.

The demands of modern civilisation are such that the height, spacing, and position of light sources should be re-arranged to avoid the use of very brilliant light sources and to reduce obstructions to vehicle and pedestrian traffic which are liable to endanger the safety of the public. Examples of overhead suspension and of the usual method of supporting by means of columns are cited, with the object of comparing them with the suggested solution of the problem.

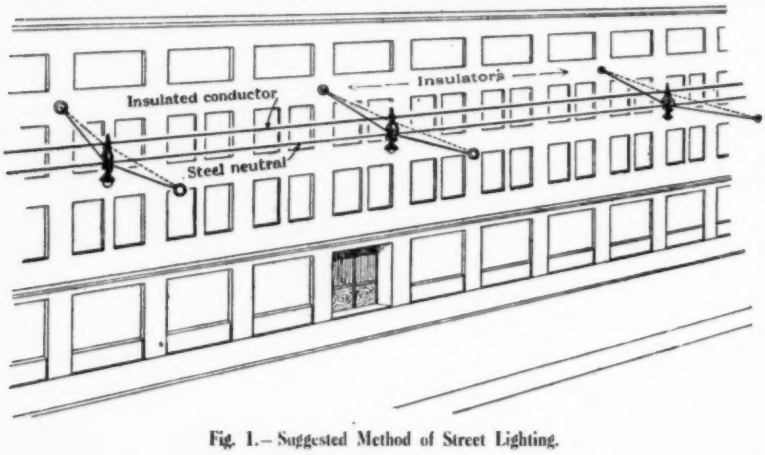


Fig. 1.—Suggested Method of Street Lighting.

High-class Thoroughfares.—It is a mistake to attempt to attain by increasing the power of the existing light sources the high degree of illumination now demanded, as these light sources would need to be too brilliant to be pleasant and would in many cases defeat their own object by reducing visibility, on account of glare. The solution of the problem lies in the use of gasfilled electric lamps.

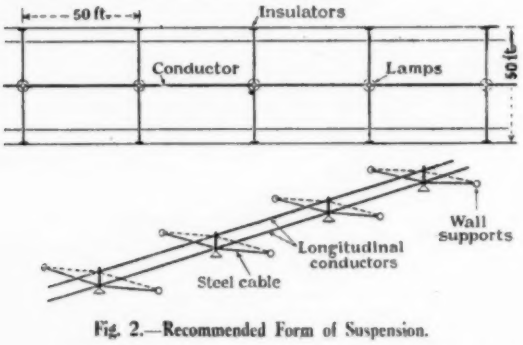


Fig. 2.—Recommended Form of Suspension.

That a completely new system must cost more to install than to convert the existing light sources, need not necessarily be the case; but, even if it should be so, the economies resulting from the more simple control and reduced cost of maintenance will more than compensate for the increased capital charges.

Buildings on either side of the street form a natural fixing for suspension. Where such buildings do not exist, or are unsuitable, steel columns set back from the road against the frontage, or in place of the buildings, would be inconspicuous and free from obstruction. Difficulties in the way of obtaining permission for fixings on privately-owned property are rare in shopping districts where improved lighting will benefit trade; there should therefore be no difficulty, with the help of the Electricity Commissioners, in obtaining Parliamentary powers to prevent permission for such fixings being unreasonably withheld.

A sample installation is diagrammatically illustrated in fig. 1, in which the buildings on one side only are shown. The form of suspension recommended is shown in fig. 2, but, if desirable to reduce the number of fixings to one-half, that shown in fig. 3 could be adopted. The steel span wires, guy wires, and longitudinal wires are insulated where attached to the buildings, or other supports, being earthed only at the switch, or feeding point, and thus become the neutral, or earthed, conductor of the system. The insulated conductor, which is threaded through reel insulators at each fitting and passes longitudinally down the centre of the street, does not carry any weight beyond its own. Where the streets bend, guy wire of small section can be taken from the top of the fitting to a wall fixing away from the centre of curvature; should it be advisable for appearance, this may be done on both sides as shown by dotted lines in figs. 1 and 2, without appreciable extra expense to all spans, in order to make the point of support of the conductor more rigid. Such guy wires do not take any weight and can therefore be of very small section. The terminal ends are guyed in the usual manner from a further point on both sides, and a large factor of safety is ensured owing to the light weight of the fittings to be suspended and to the large sag which is allowed, any swinging being prevented by the longitudinal wires and conductors; a sag in the supporting span wires of as much as 10 per cent. of their length does not adversely affect the appearance.

In the case of 50-ft. spacing with approximately 50-ft. spans, 25 ft. high, allowing for fittings weighing 20 lb. and conductors for a 1,000-ft. run with a voltage-drop of 5 per cent. when using 500 watts per fitting at 200-240 volts, the strain on any fixing will not exceed 100 lb. and, with a safety factor of 10 on the span wires, the outside diameter of any wire would not exceed 0.3 inch. The electrical details described above allow for the guard wire shown in fig. 2 to be of copper, as it acts as the neutral or earth-return conductor and is therefore of the same conductivity and resistance as the insulated main. If the construction shown in fig. 3 is used, this wire can be dispensed with, or reduced in section, depending on the area and conductivity of the diagonal span wires, which then become conductors.

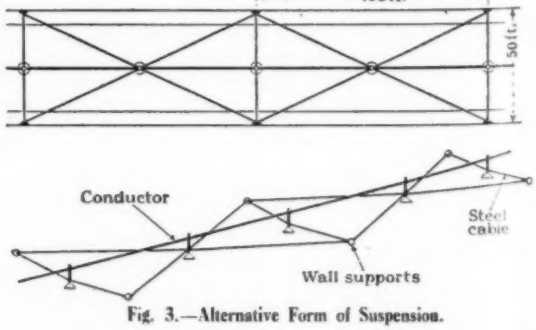


Fig. 3.—Alternative Form of Suspension.

The illuminating problem is simple, the distribution of light being arranged for in accordance with the ratio of the spacing to the height, as in an ordinary factory bay or elongated area. The use of diffusing globes is a matter of taste, as the height proposed is sufficient to keep the light sources well out of the field of vision. Due to the number of

supports, any likelihood of a live wire falling is a very remote contingency, and as they are insulated with a permanently flexible medium, no danger would result. Nevertheless, should it be advisable No. 16 s.w.g. copper catenary wire can be used between the live conductor and the guard wire at intervals.

The attention necessary for such an installation becomes a relatively small item of cost. Modern gasfilled electric lamps only require renewal two or four times per annum, depending upon the efficiency at which they are operated; cleaning, except where the atmosphere is heavily laden with smoke and dirt, is generally carried out 12 times a year. Access to the light sources should be gained by means of electrically-propelled and operated battery tower wagons especially designed for the purpose. The cleaner, without lowering the platform, could move from lamp to lamp, and it is estimated that one man could deal with an installation of 1,000 lamps at the spacings suggested (or even when spaced at 100 ft.), which represents a total cost of attention not exceeding 4s. per lamp per annum.

The cost of lighting and extinguishing becomes negligible where the lamps are controlled on the group system by time switches, or by the police, as one switch can be made to deal with many hundreds of lamps if relays are introduced at the feeding points.

It has been stated that an average life of 2,000 hours can be obtained by operating lamps at a pressure 5 per cent. below that marked on them, but this would result in a reduction of nearly 20 per cent. in the candle-power (with high-power lamps); thus the energy should be increased by that amount. With electrical energy below 1½d. per unit a saving would still be effected. When lamps are allowed to burn out at various times, the labour cost of renewal is increased, as a greater number of special visits has to be made for that purpose, and noticeably irregular lighting results, owing to the great variation in candle-power often found between two adjacent light sources, due to one being new and the other of extreme age.

Light diminution causes include the following:—

(1) Original tolerances allowed to lamp manufacturers by the B.E.S.A. Specification; reduction of 12.5 per cent. (2) Decrease in power during 1,000 hours; reduction of 10 per cent.

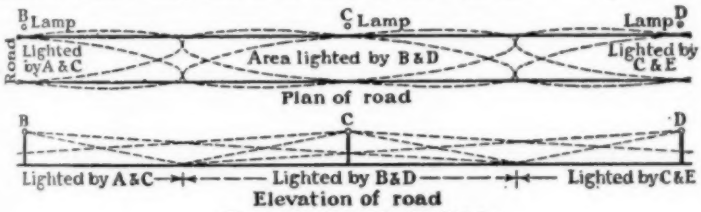


Fig. 4.—Method of Traffic Lighting.

(3) Reduced pressure at point of connection (4 per cent. allowed) causing reduction of light, say, 10 to 16 per cent. (4) Absorption of light by dirt up to, say, 25 per cent. If all these factors were to operate adversely to their maximum extent at the same time, the illumination would be reduced by over 50 per cent. Fortunately such a contingency does not often arise, but a reduction to from 60 to 70 per cent. of the designed illumination is not uncommon and should be allowed for.

The prime cost of an installation such as that described by the author, including all the necessary materials, and erection, is as follows:—

(a) Minimum 1 foot-candle ... ... £650 per mile.
(b) Minimum 0.5 foot-candle ... ... £575 per mile.
(c) Minimum 0.25 foot-candle ... ... £525 per mile.

When fixings cannot be obtained on buildings, steel poles can be of relatively small dimensions if guyed outside the limits of the street, and the increased cost would probably not exceed 50 per cent. Maintenance and operating costs, including electrical energy at 1d. per unit, four lamp renewals per annum, lighting and extinguishing, cleaning, interest and sinking fund on a 10 years' loan basis are approximately:—

(a) Minimum 1 ft.-candle ... £1,000 per mile per annum.
(b) Minimum 0.5 ft.-candle ... £600 per mile per annum.
(c) Minimum 0.25 ft.-candle £475 per mile per annum.

Comparison with existing practice shows that for the same standard of illumination the operating cost above-mentioned would be little more than that required to cover the interest and sinking fund, despite the fact that these do not include the mains.

Less Important Thoroughfares.—The problem of side streets, residential streets, roads used for traffic, country-town and suburban districts and the numerous slums in all large towns is, in the author's opinion, by far the more important, not only on account of its magnitude, but because it affects the safety and to a large extent the welfare of the masses.

Side streets, lanes, alleys and slums can all be dealt with on the lines suggested for the better-illuminated streets, as they are generally narrow and the buildings eminently suitable for fixing. The minimum degree of illumination to be aimed at should not be less than 0.1 foot-candle, which could be obtained by light sources spaced 100 ft. apart and 25 to 30 ft. high, and consisting of 100-watt lamps in suitable reflectors. The capital cost of such an arrangement, based on switch feeding points at half-mile intervals, would not exceed £450 per mile, including conductors. The operating charges, allowing for repayment of the loan in 10 years and 1d. per unit for the supply of energy, would work out at approximately £165 per mile per annum, or probably much the same as the present form of "beacon" lighting giving a minimum illumination of 0.0015 foot-candle, *i.e.*, practically darkness between light sources.

The middle-class residential districts and suburbs are more difficult to deal with, owing to the buildings being set back from the road; this problem should be dealt with in conjunction with the private supply, as the decision may rest upon the suitability of the underground or overhead system, bearing in mind that developments in this country tend towards a.c. distribution, in which case overhead conductors have many advantages when dealing with this class of district.

If existing lamp posts and lanterns must be used, it is imperative in the majority of districts that their numbers should be doubled in order to reduce the spacing to a reasonable limit, and that the most powerful light sources permissible, considering the low height, be introduced. The cost of the change will, however, probably exceed that of a complete new installation on modern lines.

Traffic Lighting.—High roads, arterial roads, and those used by modern high-speed traffic through rural districts, require consideration on account of the danger they represent to the public.

The author has carried out many tests on the "beam" method of traffic lighting, in order to investigate the proposals published in his paper on "Street Lighting" before the National Illumination Commission at Geneva in 1924, in which he suggested that the source of illumination should be rigidly fixed below the level of the eye in order to prevent glare completely by removing the lamps from the field of vision. The result fulfils all the requirements scheduled by the authorities who have issued regulations on the subject of headlights, but the effect on the public is so extraordinary that it is doubtful whether the method will ever become popular.

From research and the regulations already published and adopted for motor-car lighting, it would appear that in order to preserve the safety of the public as one approaches a light source its power should be reduced and the illumination on the obstruction remain the same.

A solution of the problem is to use, say, 30-ft. high light projectors rigidly supported on the sides of buildings or poles carrying the necessary overhead conductors. These may be spaced at distances, say, of 300 ft., or from 17 to 20 to the mile. To produce an illumination of 0.25 foot-candle on a vertical object at any part of the road the maximum candle-power would need to rise to about 40,000 at a distance of from 300 to 400 ft., which does not cause inconvenience. The power would be diminished at 250 ft. to 16,000 candle-power, and at 150 ft. to 6,000 candle-power; and at 100 ft. it would fall to zero, as the light from the source beyond the adjacent one comes into operation. The lamps and reflectors would be of the motor-car headlight type, easily constructed and maintained. The result required can be obtained without difficulty by using 50-watt lamps of low voltage (say, 10 to 12 volts), of which there would be two at each support, or a total of 100 watts, *i.e.*, say, 2,000 watts per mile.

The capital cost, including overhead mains and pole supports, would not exceed £300 per mile, the cost of electrical energy at, say, 1d. per unit being £35 per mile per annum. The cost of lamp maintenance is difficult to estimate, as 10-12 volt 4-ampere lamps are not largely used at the present time in this country, but there is no reason to suppose that it would exceed £2 per point, or £40 per annum, and might not reach half that figure.

With d.c. the lamps would need to be in series of approximately 20 on the 200-240 volt circuits. With a.c. separate 100-watt transformers or compensators wound for a high efficiency at a constant full load could be used, thus making it possible to vary more easily the number of lamps on one circuit. The general principles are illustrated in fig. 4, from which will be noted the effective means of overcoming glare.

Open Spaces, &c.—For lighting open spaces, parks, bridges, &c., the use of underground conductors is generally essential, and, with the exception of bridges, all-round light distribution is required. For open spaces of large area the best effect can be obtained with powerful light sources on very high standards.

State Inspection of Dams.

As the result of investigations and suggestions which have been made consequent on the failure of the Dolgarrog dam, North Wales, last year, a Bill has been drawn up and presented by Major Owen to the House of Commons. The Bill provides for the inspection at any time by the Secretary of State of any dam, embankment, or reservoir in the country, either during the course of construction or when completed. Further, in the event of any dam, &c., being found defective, the owner is to be called upon, under penalty, to remedy the defect.

The Electrical Production of Steam.

The economic production of steam by electric boilers is possible when the cost of electricity is low: 200 installations are believed to be in operation at high efficiency, giving satisfaction.

(*Abstract of Paper read before the* INSTITUTION OF ENGINEERING INSPECTION.)

At a meeting of the Institution of Engineering Inspection, held in London, on February 25th, Mr. C. J. Wharton, O.B.E., M.I.E.E., read a paper in which he showed that it was a commercial and economic proposition—under certain circumstances—to generate steam by electricity. The conditions required were very cheap electricity, all machinery in the works electrically driven, and yet a quantity of live steam required for process purposes in the mill or factory. The inventor of one type of electric boiler had suggested as a formula that where electricity could be obtained per kilowatt-hour at a price equal to from one-third to one-fourth of the cost of a kilogram of coal, electrical production of steam began to be economic. Translated into English terms, the author put it roughly that where coal was 30s. per ton and electricity 0.1d. per unit, coal *might* economically be displaced by electricity for the production of such steam as was required for purposes other than power; but undoubtedly every case required individual investigation.

Last year the proposition was put before him by clients in South America that for approximately 10 hours out of the 24 they used from 1,000 to 1,500 kW less than their average load, and that the bulk supply company was prepared, if the consumers could fill up this valley in the load curve, to supply energy at a price of between 0.07 and 0.08d. His clients took into their works continuously several thousand kW at 6,000 volts, 50 periods, the greater part of it being transformed on the premises to 400 volts. Their power was all electrical, but they required for the manufacture of one of their products a quantity of steam amounting to 20,000 lb. per day, and this amount was likely to be doubled. It was required at a pressure of between 10 and 20 lb. Fuel, however, was very expensive, and it was a question whether it would be possible to substitute electricity for the fuel.

Such figures for electricity as those mentioned above were not obtainable in this country, but he had found that the subject had been fully worked out in Sweden and Germany, and to some extent in Canada, Switzerland, and Italy. Numerous works in the first-named two countries were using electric boilers with complete satisfaction. The London representatives of the makers of the Swedish and German systems had held out the promise of such performances as were almost impossible to believe without personal investigation, and he had decided that the systems should be inspected, and that the users should be asked to give their views. All the statements made by the manufacturers were borne out by the users; the extraordinary efficiency, the ease of working, the absence of any injurious effects on the boiler itself, and the general perfect satisfaction experienced by the users were most surprising. Nearly every engineer in charge of an electric boiler, whether it had been working two, three or four years, emphatically declared that he had no maintenance charges whatever. The author had inspected an installation at Freiburg, with regard to which the City Engineer, Mr. E. Eitner, had stated that it had fully justified the expenditure and had proved a great commercial success, that the upkeep costs of the boiler had been absolutely nil, and that the boiler worked silently and gave no trouble to the supply circuit, the loading of the three phases being perfectly balanced. The only exception to the "no costs" reports met with was in the case of a pulp mill at Gota, Sweden, where a bank of three large boilers, each taking 3,000 kW, was working at 10,000 volts, and, with the exception of two weeks in each year, had been running at full load for 24 hours a day for four years. The only renewals in that time had been some electrodes and a few porcelain parts; this was considered by the user to be highly satisfactory under such severe conditions. The boiler shells showed no trace of pitting or corrosion.

The underlying principle of the two systems of boiler was the same, *i.e.*, the boiler, relatively to the output, was a small one of vertical type with three iron electrodes immersed in water, and three-phase current at 8,000 to 10,000 volts was applied, the water itself being the resistance whence the heat was obtained. The details, however, varied considerably.

In the Swedish, or "Volta," type the water level in the boiler was kept uniform, and variations according to input of electricity and output of steam were obtained by raising or lowering vertical tubes surrounding the electrodes, which shortened or lengthened the path of the current, the entry of the conductors in this case being through the bottom of the boiler to vertical electrodes fixed to the base of the shell.

In the "Penzold," or German, system the leads were brought in through the top, and hanging electrodes were used with piled disks of insulating material surrounding them to direct the course of the current, while the work done was varied by raising or lowering the water level. Both systems might be made wholly automatic or might be hand-controlled.

In practice he could find no difference in the satisfaction given to the user, that satisfaction being based upon (1) the very high efficiency of conversion; (2) the extreme cleanliness of the operation; (3) the small space occupied for a large output; (4) the complete automatic possibilities, reducing attendance costs to almost nothing; (5) the virtual absence of repairs, maintenance and depreciation.

The efficiency claimed was nearly 100 per cent., as practically every kWh expended was returned in B.th.u., the only loss being the heat lost by radiation. This loss could be brought down to the lowest dimensions by thorough lagging of the whole of the boiler, and the makers guaranteed an efficiency of 96 per cent. There was a further loss, however, due to blowing-off the mud deposited from the impurities in the water. It was essential, of course, that the conductivity of the water should remain constant. Perfectly pure water could not be used, in view of its high resistance; a certain amount of impurity was necessary, but as this did not pass over with the steam, the conductivity of the water gradually increased, so that it was necessary to blow out the surplus and keep the water in the boiler at approximately uniform analysis. The net result was that with feed water at 68 deg. F., one kWh would produce 2.75 lb. of steam at a gauge pressure of 114 lb., and the installation with which he was concerned was guaranteed to do that. Similar results had been obtained in other plants which he had seen working on the Continent.

Dealing with the space occupied, he referred to a case in which three Lancashire boilers were supplying a large building with steam. The building was owned by the municipality, which also owned the electricity supply system; whenever current could be spared the electrical system was used, and was greatly preferred. The comparison between the two with regard to space required was significant, for the electric boiler occupied a space in the corner not more than 7 ft. by 7 ft., including switchgear and everything else, and it did the same work as the three Lancashire boilers.

The manufacturers of the Swedish and German plants had worked out very complete automatic systems for regulating the input of electricity and/or the output of steam, and no attendance was required for hours at a time. In the South American works with which he was concerned, the boiler was not connected directly to the consuming mains, but fed a Ruths accumulator, because a cheap supply of electricity was not available at the time when the steam was required, and switches were arranged so that when the full capacity of the accumulator was reached the current was automatically cut off and the boiler went out of action. On the other hand, if steam were being used during the time the boiler was working, the pressure in the accumulator would fall according to the demand, and the input from the boiler was automatically increased, so that the pressure and quantity of steam entering the accumulator might be varied to suit the demand.

The very small amount of wear and tear in the electric boiler was undoubtedly attributable to the fact that the greatest heat in the whole apparatus was at the point where the steam was generated, in the middle of the water, and the lowest temperature was necessarily at the outside of the boiler plates. Incidentally, this made for small heat radiation.

The electrodes, of course, might be expected to show some signs of deterioration, but owners of boilers which had been working 10 or 12 hours a day had told him that there was no wear of the electrodes after two, three, or even four years of use. This was due to the fact that in both types of boiler the greatest heat was developed, not at the electrode itself, but at some distance from it. This result was brought about in the "Volta" boiler by the movable tubes, which acted as a deflecting shield, whilst the makers of the "Penzold" boiler, considering that the porcelain or quartz tubes were liable to fracture, had evolved a system of surrounding each electrode by four rods which carried a number of insulat-

ing disks, so constricting the passage from electrode to electrode, or electrode to shell, that the greatest heat was developed away from the electrode itself. He had heard of other makes of electric boilers in which these deflecting shields were not used, with the result that an arc was sometimes formed, which not only ate up the electrode, but also caused considerable out-of-balance on the phases, which, of course, would be fatal to the success of any such boilers if connected to a general electricity supply system.

The plant for the works in South America consisted of one boiler for three-phase, 6,000 volts, the maximum input being 1,000 kW, and maximum output per hour 2,750 lb. of steam at 114 lb. pressure. The dimensions were: height 7 ft. 2 in., and diameter 4 ft. 6 in. There was also one Ruths steam accumulator complete, having a capacity of 19,800 lb. of steam, its length being 57 ft. 6 in., and its diameter 10 ft., with all valves and fitments, including oil-driven automatic valves for 80 lb. and 24 lb., respectively. There was one oil-cooled transformer, 1,000 kVA capacity at 6,000 volts, ratio one-to-one, wound for delta-star. The transformer was required because the power company supplied on the non-earthed or delta system, and the supply to the boiler must of necessity be earthed. Indeed, the action in the boiler was somewhat complicated, being of a combined star and delta nature, but at any rate the boiler shell must be earthed, and the one-to-one transformer was the easiest and safest way out of the difficulty. Steam generation would take place mostly at night, but a certain amount of electricity would be available at meal times, and as the electric boiler could be started up in a few minutes, even an hour's generation of steam would help to keep the accumulator full. The author anticipated results from this installation equal to those obtained on the Continent. He believed there were at present over 200 installations of electric boilers producing steam at high or medium pressure, or heating water for internal warming.

Inasmuch as it was usual to couple with electric installations a system of storage, the author described the Ruths accumulator system.*

In the South American plant its main object was to store up the steam energy which could be produced economically at night and to give it out during the day. It was to be put on the roof of a two-storey building, and provision was being made to triplicate the installation at some future date. It was calculated that the saving, as compared with the present fuel-fired system, would be so great that the whole capital cost of the installation would be covered in three years.

In conclusion, the author said that although the cost of electricity in this country could hardly be expected to rival that referred to as obtainable in South America, and that consequently electric boiler installations on a large scale could hardly be looked for here, there might be cases in which the raising of a small quantity of steam by electricity would be an economic proposition.

Discussion.

Mr. C. M. READ (who visited Sweden on Mr. Wharton's behalf for the purpose of investigating the electric boilers in use there) said the point which had impressed him most was that the use of the electric boiler was looked upon almost as common practice in Sweden; quite a number were installed, and in every case, apparently, they were giving every satisfaction. The use of the Ruths accumulator appeared to be even more general. He was inclined to favour the "Volta" system, in which the current was led in from the bottom, for various reasons. He had looked particularly for signs of pitting of the boiler shell due to electrical action, but there were no signs of pitting at all, and there appeared to be no scaling of any sort. The marks of riveting were still to be seen, although the boiler had been in use for two or three years. He had heard that Swedish engineers were experimenting with boilers having a voltage of 33,000 V. They were not worked by the electrode system, he understood, but by applying the current—three phases—to three separate jets of water, the jets being directed one against the other.

Mr. MCKINSTRY (Metropolitan-Vickers Electrical Co., Ltd.) said that in this country there would be a very small market for this kind of plant, but British engineers had to cater for all kinds of conditions in all parts of the world, and for that reason it was of very great interest to them to learn of systems of this description. He knew of cases in India, Australia, and New Zealand where electricity could be supplied at prices which would make the operation of a system of this kind feasible.

Mr. NORMAN SWINDIN referred to his experience with a submerged flame boiler, and said he could quite accept the statements with regard to the extremely high efficiency and the absence of scale, due to the fact that the heat was supplied from the inside of the boiler and not through the plates from the out-side.

Mr. N. DUFTY (of the A.E.G.), dealing with the suggestion that there was very little call for electric boilers in England, said his firm had under construction seven locomotives, driven by steam, for use in rolling mills, the steam being generated by electricity during periods of light load. That had been found to be an economical proposition. Replying to questions as to the feed of the "Penzold" boiler, he said it operated with a magnetic cut-in and cut-out. There had been no trouble with the leading-in insulator. His company had a boiler of 135,000 volts under construction. There was an electric boiler water-heating plant in operation in London. Dealing with criticism of the fact that the order for the Rio plant had been placed in Germany, he said that if British manufacturers wanted orders in Brazil they should send engineers there, just as the Germans had to do.

Mr. S. S. JEWSBURY (Messrs. G. N. Haden & Sons, Ltd.) said that his firm had been working on the same lines as Mr. Wharton, and he had visited the Continent to ascertain the most suitable type of electrically-heated boiler to use in connection with the heating and hot-water supply installations at the head offices of the Newcastle-on-Tyne Electric Supply Co. After careful consideration it was decided to provide two electrode type boilers, each having a capacity of 1,000 kW, and working at a line pressure of 6,000 volts. These boilers would generate steam at a pressure of 50 lb. per sq. in. above atmosphere, and would supply it to calorifiers for heating the water in the large heat-storage cylinders of the heating apparatus. Current would be taken between 7.30 p.m. and 7.30 a.m. The building would be warmed during the day by the hot water from the storage cylinders. Similar storage apparatus would be provided for the hot-water supply installation. Each boiler would be capable of regulation between 300 and 1,000 kW, and would have a full-load capacity of 2,800 lb. of steam per hour. Automatic devices would be provided for regulating the steam pressure and the water level. It was hoped that the plant would be working by August this year, and it was anticipated that during the course of the general exhibition to be held in Newcastle next year the Electric Supply Co. would allow visitors to see the steam boilers in operation. As the result of its investigations, his firm was convinced that there was an opening for apparatus of this type in this country, and especially in London; but, of course, each individual case must be investigated on its merits.

The Chairman (Mr. R. P. WILSON), referring to Mr. Wharton's statement that, with coal at 30s. per ton and electricity at 0.1d. per unit, the production of steam by electricity was justified, said that although those conditions did not obtain here, Mr. Jewsbury's remarks would appear to indicate that there were many cases in this country in which the circumstances were such as to bring about an almost identical set of conditions. Our central-station engineers did not appreciate what was apparently a paradoxical point of view, namely, that in many cases it paid to sell electricity at less than it cost to produce.

* A full description appeared in the ELECTRICAL REVIEW of May 28th, 1926.

Electricity on Board Ship.

The Royal Mail Steampacket Company's new motor-ship, *Alcantara*, which arrived at Southampton from the builders, Messrs. Harland & Wolfe, recently, has a very complete electrical installation, supplied by four Diesel-driven generators, of a combined capacity of 1,600 kW, in addition to a 75-kW emergency dynamo placed above the margin line, which can supply light and power for all essential services if required. Over 50 large fans are installed throughout the ship for the supply of cool air, in addition to over 450 smaller fans in the state rooms and public rooms for local ventilation. The heating is also electric throughout, there being some 500 large heaters distributed throughout the various apartments, each separately controlled, in order that heating may be regulated at will. All the engine-room and deck auxiliaries are electrically operated, for which over 130 motors are installed, besides those mentioned for driving the ventilating fans; they are of various sizes, the largest being those for the manœuvring compressors, which are of 180 b.h.p., and for the compressors of the refrigerating plant each motor is of 110 b.h.p. A novel device comprises an illuminated track-chart installed in the entrance to the first-class quarters which has a little model ship operated from the electric clock system, and indicates the ship's position at any time during the voyage. Lighting is carried out by some 4,000 electric lamps distributed throughout the vessel, which include the lights for navigation purposes, Morse lanterns, and the high candle-power lamps and lanterns for working the cargo, and in connection with the illumination of the boats under the latest Board of Trade regulations. The ship is fitted with echo sounding gear. In the hospitals and barbers' shops electrical apparatus is installed; there are seven electric lifts and hoists. Cooking is entirely electric: there are five large ranges and two ovens for the bakeries; in addition to salamanders, grills, fish fryers, and toasters; two mincing machines; one cake whisk; one coffee mill; one bacon slicer; one ice-cream machine; four plate washers; three potato peelers; two dough mixtures; one printing machine; one laundry motor; one gymnastic motor; a photographic printing machine; and a very complete system of bells and telephones.

The radio-telegraph installation consists of standard Marconi 1½-kW quenched-spark and valve transmitters, and a valve receiver covering all commercial wave-lengths, augmented by a direction-finder installation. The musical interests of the passengers are catered for by Marconi band-repeater equipment; four microphones and six loud-speakers are included. The *Alcantara*, of 22,181 gross tons, with accommodation for 1,800 passengers and crew, commenced her maiden voyage to South America on March 4th.

The "Ideal Home" Exhibition.

A Review of the Electrical Features of this year's show at Olympia, London.

(*Continued from page 408.*)

ACCORDING to Sir John C. W. Reith, Director-General of the British Broadcasting Corporation (Inc.), every eighth home in America is licensed for the reception of broadcast radio-telephony, while in Great Britain receiving equipment is installed in nearly 3,0.0,0.0 out of about 7,000,000 homes. No "Ideal Home" Exhibition would therefore be complete nowadays without a display of receiving apparatus, and it is accordingly fitting that some space at Olympia has been devoted to exhibits of this character.

The B.B.C. Demonstration.

At past shows the B.B. Co. allowed visitors to see how programmes are broadcast, the actual performances taking place in a specially-constructed sound-proof studio being watched through glass windows. This year, however, the point of view of the listener is receiving special attention:

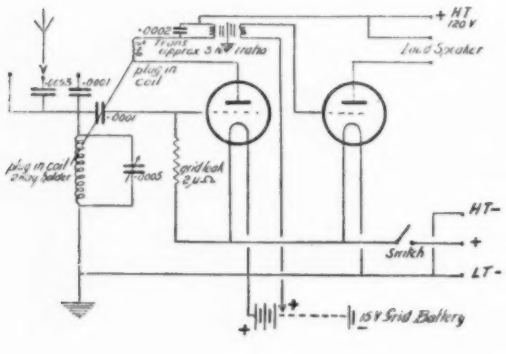


Fig. 2.—A 2-valve Receiver Diagram.

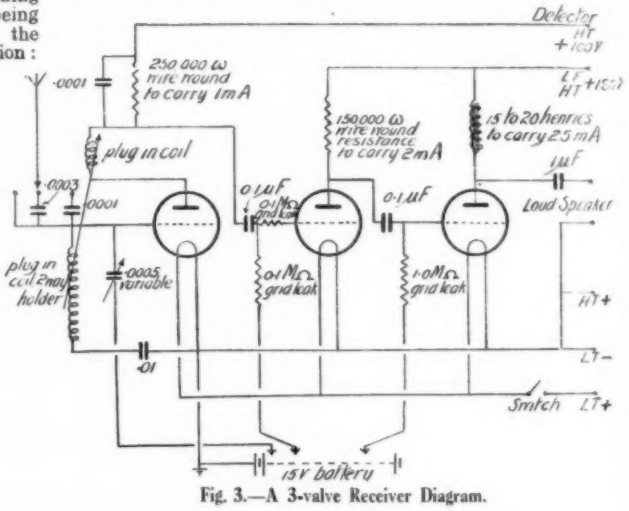


Fig. 3.—A 3-valve Receiver Diagram.

three different types of sets are in operation, the object being to demonstrate the quality of reception and excellence of reproduction it is officially considered well-chosen loud-speaker sets should be capable of within the service areas of the B.B.C. stations. In this way the public is afforded for the first time a reliable and unbiased standard of comparison.

The instruments are representative of cheap, medium-priced, and expensive outfits; no consideration whatever has been given to such factors as appearance, attention having been devoted entirely to sound design and technical merit. The speakers employed are concealed from view and the names of the makers of the component parts wherewith the receivers were built have not been revealed, but the circuit diagrams (figs. 2, 3, 4 and 5, reproduced herewith) are displayed for inspection, and comparable results are obtainable from carefully-assembled high-grade apparatus of reputable make purchasable through any dealer of standing. The two- and three-valve sets (figs. 2 and 3) presumably operate cone speakers, whilst the large set (fig. 4) is a 5-valve, straight-circuit outfit, with one stage of high-frequency amplification; the last stage of low-frequency magnification consists of two large-power valves connected in parallel for driving a moving-coil type of speaker, and the power supply is obtained from lighting mains, fig. 5 indicating how the connection thereto is made.

The novelty of distant reception, which caused receivers to be judged by the number of transmitting stations they were capable of being tuned to, is waning, and vigorous preference is now being shown for quality; that is, fidelity of reproduction of the local programme. Manufacturers are rising to the occasion, and the British Broadcasting Corporation's admirably conceived effort at Olympia will be of practical value to all concerned. Its demonstration of actual possibilities should satisfy most people, whilst the large combination is in a class by itself.

A Cliftophone-Celestion Demonstration.

One of the most interesting of the radio exhibits has been arranged to demonstrate the capabilities of equipment made by Cliftophone, Ltd., and the Celestion Radio Co., to reproduce music of adequate volume in the New Hall. Several systems of electrically reproducing and thermionically amplifying gramophone music and speech are on the market, but one of the particular merits of the above-named outfit is its British origin and workmanship throughout.

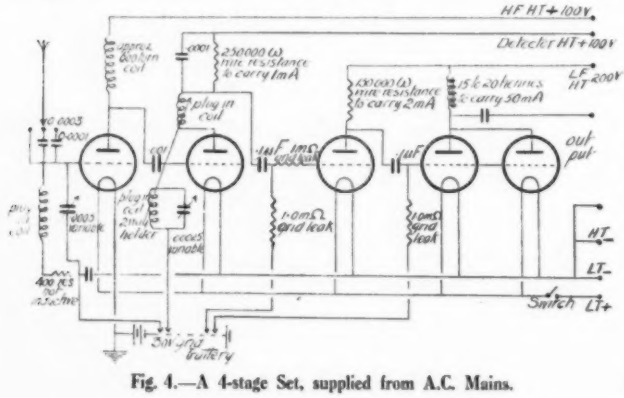


Fig. 4.—A 4-stage Set, supplied from A.C. Mains.

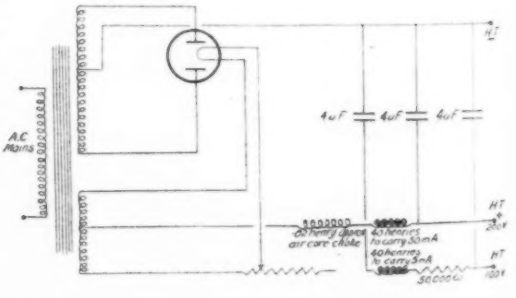


Fig. 5.—Method of Obtaining High-voltage Supply from A.C. Mains.

Mr. W. E. Clifton, the inventor, employs an ordinary type of clockwork gramophone, records and steel needles: the usual sound box and tone arm are, however, replaced with a needle-actuated electromagnetic current generator (said to be constructed on unusual lines) which couples the machine to a thermionic amplifier. The latter is small in dimensions, and incorporates a valve switch and means of controlling the volume; the magnification of the three Marconi valves used is of a large order with a total plate current 20 mA, whilst

the circuit employed is claimed to be of novel form. Details are, however, not available for publication.

To convert the electrical output of the amplifier into sound, three standard "Celestion" A3 radiophone loud-speakers* (one of which is illustrated in fig. 6) are used in parallel: each

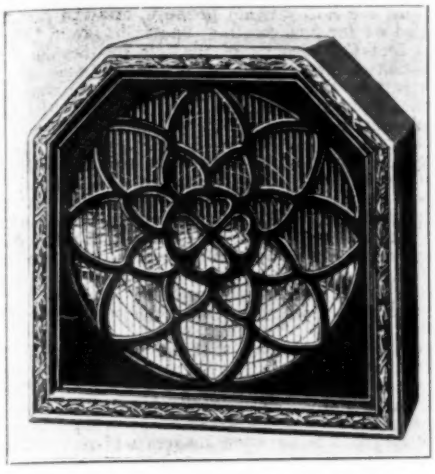


Fig. 6.—Standard "Celestion" Loud Speaker.

being of 2,000 ohms resistance, the impedance of the combination is of the high order of several hundred thousand ohms. The choice of the "Celestion" horn-less speaker is a tribute to its qualities, and the outfit functions satisfactorily, the musical effect being of a pleasant character.

Other Radio Exhibits.

The Cunard Steam Ship Co.'s exhibit affords some idea of the many comforts provided on passenger liners; a fully-equipped wireless cabin is on view, the apparatus including a direction-finding outfit, and an operator is on duty to explain the function of the various pieces of plant, which was manufactured by SIEMENS BROTHERS & Co., LTD., of Woolwich.

The HALYCON WIRELESS SUPPLY CO., LTD., displays a selection of portable broadcast receivers of the multi-valve type; in addition to these standard models, a portable 7-valve superheterodyne set is shown, the tuning of which is claimed to have been simplified.

MESSRS. S. G. BROWN, LTD., besides samples of their wide range of products, are showing a receiving set that dispenses with the use of valves and accumulator, yet operates a 21-in. loud-speaker. It may be arranged to work with an indoor, outdoor, or frame aerial within a radius of six miles from a broadcasting station and 15 miles from Daventry.

MESSRS. PETER CURTIS, LTD., have several patterns of their receivers on view, housed in handsome wood cabinets; also the Curtis-Clayton tester, which is a single-valve receiver with a self-contained frame aerial, but it can also be used as a universal testing instrument, as a wavemeter, a generator of sustained audio-frequency current, a calibrated variable condenser, and for the measurement of resistance, voltage, current, &c.

The "Donotone" loud-speaker, patented by MR. P. S. O'DONNELL is housed in cabinets of handsome and original design, and is of novel construction. The pole pieces of the usual electromagnet are wound for a very high impedance and across them is a spring armature, to the centre of which is fixed a small glass disk holding a flat diamond. Another diamond (pointed) is attached to one end of a short steel rod, which has a reciprocating motion in a sleeve, a light helical steel spring between the rod and sleeve maintaining the two diamonds in simple contact with one another; sound is produced by a tapping, similar to the vibration of an electric bell armature. Several silk disks, from 2 in. in diameter upwards, are threaded concentrically on to the sleeve, the largest (12 in. in diameter) being attached to the free end of the diamond-pointed rod; all the disks are free to vibrate. Several inches in front of the disks a series of gongs, of the spiral clock type, are screwed individually around the mouth of the flare, with metal baffle plates between them; the 24 gongs, ranging from treble C to bass C, are chromatic and tuned to sympathetically respond to their own notes.

L. G. Hawkins & Co., Ltd.

This exhibit comprises an almost complete range of electrical labour-saving equipment for the home, including the scientifically designed "Miller" and "Ivanhoe" lighting fittings and "Universal" electric cookers, suction cleaners, and washing and ironing machines. The "Kelvinator" electric refrigerator plays an important part on this stand, a variety of sizes being shown. It might be safely said that the exhibit is representative of every kind of electrical apparatus for domestic use. Some excellent designs of such apparatus as electrical coffee percolators are attracting the attention of those in search of home-beautifying utensils. Demonstrations are being given practically continuously of electric ironing, cooking, and coffee making. It is of interest to note that Messrs. Hawkins are proud of their claim to be among the pioneers in the representation of the electrical industry at the exhibition. They first exhibited in 1920.

* For constructional details see ELECTRICAL REVIEW, June 19th, 1925, p. 995, and September 3rd, 1926, p. 380.

Hotpoint Electric Appliance Co., Ltd.

This firm is emphasising in particular the use of electricity for domestic laundry work, and an interesting feature of the display is the "Maytag" gyrafoam washer, fig. 7, which has only recently been introduced in this country, and which, it is claimed, is the only electric washing machine on the market into or from which the clothes may be put or taken while the machine is running. The tank is rectangular in shape, the corners being suitably rounded inside, and stands on four legs equipped with rollers. The agitating or disturbing element is in the form of four vertical blades projecting from the interior of a shallow cup at the bottom of the tank. This is rotated in alternate directions by means of a crank attached to the shaft of a worm-driven wheel, the worm being belt driven from a small motor conveniently housed under the tank. The effect of the movement is certainly quite distinct from that of the usual rotary action. A vertical extension of the crank shaft to the top of the tank, with its housings, serves as a fixing and driving medium for a wringer, knife cleaner, and a mincing machine. The apparatus can also be used for dish washing, the tank accommodating a wire basket for this purpose. It is interesting to learn that the West Ham electricity undertaking is hiring out these washers on an ordinary rental basis.

Another interesting piece of electrical apparatus to be seen on this stand is the "Eco-Dry" cabinet for the indoor drying of clothes. This is a cast-aluminium cupboard equipped with the necessary sliding brackets and a suitable

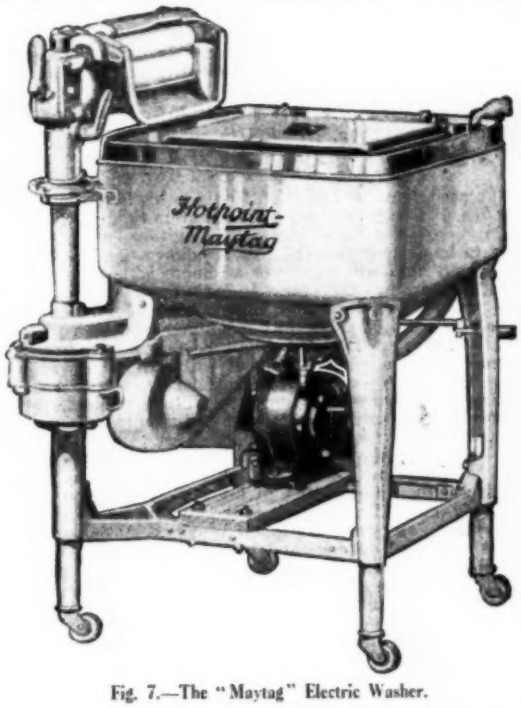


Fig. 7.—The "Maytag" Electric Washer.

exhaust chamber. It is loaded at 3 kW. The "Hotpoint-Utenco" ironer is also shown by this firm. The outstanding feature of this machine is its two-roller principle of construction. The polishing roller, which is evenly electrically heated, revolves five times faster than the feed roller, thereby producing a gloss equal, it is claimed, to that obtainable by means of a hand iron. The rollers are self adjusting. On the pedestal carrying the rollers is bracketed the driving motor, about ¼ h.p. The heating loading is 1,000 W. The "Hotpoint WB25" wash boiler is also exhibited. This holds 10 gallons of water and is provided with immersion heaters. Of particular interest in the cooking equipment shown on this stand is a new type of totally enclosed boiling plate. The elements are housed in a sheet-metal box, which is bolted to the cast top-plate. The under side of this is treated with a special insulating material. The plate is sent out sealed, complete with a 3-pin plug, under a 12 months' guarantee. It is interchangeable with the existing 3-heat plates.

With regard to the large electric-light shades at Olympia, described in our last issue, we are asked to make it clear that Messrs. Wm. McGeoch & Co., Ltd., were not the contractors for installing the shades, but were responsible to the architect, Capt. Tanner, for them. Messrs. Walford Art Co. were engaged by Messrs. McGeoch as sub-contractors.

(To be continued.)

Correspondence.

***Correspondents should forward their communications* as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

The Price of Electricity for Home Use.

Hearty congratulations on your leader concerning the reduction in the price of electricity for domestic purposes. Could not you see your way to having a special "Economic" number of the Review, with reports from one or two undertakings enlightened?

In this connection may I suggest that the two-part tariff be adopted throughout the country, and, furthermore, be the only tariff as far as domestic supply is concerned? This for three very good reasons:—

(1) Considering the complex nature of the subject, it is simple, and is the only tariff that is fair (or can be made so) to both consumer and supply undertaking.

(2) By means of rebates on kW connected and type of load it lends itself readily to preferences for large consumers and those who by various devices improve the load factor. This system of rebates will obviate any necessity for double metering or time switches, thereby keeping down capital expenditure.

(3) The standing charge and the price per unit could be, and should be, revised every year, or, for that matter, every six months, bearing in mind not only the number of new consumers connected, but the capital charges involved in the new extensions.

I am convinced that the price of electricity is the biggest factor in deciding the rate of increase in domestic electrification, and a systematic reduction in the price, based on the previous six or twelve months' working, widely advertised, would be the best way of bringing in new consumers, and encouraging the extended use of current by old ones.

£40,000,000 (if my memory serves) was spent at last year's motor show, simply because the car industry had created a demand by reducing the price, instead of carrying on after the manner of supply undertakings.

Cyril J. Crawshaw, B.Sc.

Newcastle-upon-Tyne, *March 11th*, 1927.

River Water—or Cooling Towers?

The reason given by Mr. R. J. Kaula in his letter dated February 7th, 1927, why turbine manufacturers rigidly confine the consumption guarantee to one set of conditions, appears to the writer to be quite inadequate, for it ignores the fact that the terminal pressure will vary over an appreciable range according to the season of the year. In a river-side station the terminal pressure will vary from round about 0.7 in. Hg. in the winter to about 1.4 in. Hg. in the summer, and such variation is not controllable. Therefore, the turbine will have to operate over such a range normally, and it will entirely depend upon the season of the year when the official acceptance tests are made as to what terminal pressure will be realised. Surely the purchaser is entitled to call for a guarantee covering the normal variation of an important condition. The writer fails to see why a guarantee giving definite consumptions at, say, 0.8 in., 1.1 in., and 1.4 in. Hg., should be any less clear or unequivocal than a guarantee giving the consumption at, say, 0.9 in. Hg. only. To the writer, the two forms appear to be equally clear, and from the point of view of comparing the relative merits of tenders and also from a testing point of view, the guarantee covering the normal variation in conditions offers definite advantages to the purchaser. Readers interested in this side issue will find it adequately outlined in a paper on "Performance Guarantees for Power Plant, with reference to Official Acceptance Tests" by the writer submitted at the 1924 I.M.E.A. Convention.

Mr. Kaula states that the thermo-dynamic efficiency of two units operating at the respective terminal pressures given in the article will be practically the same. If the term "thermo-dynamic efficiency" is given its true meaning—the ratio of heat output to heat input—the statement is obviously incorrect. Presumably the term "thermodynamic efficiency" has been used to denote "efficiency ratio." (In the writer's opinion the modern fashion of using thermo-dynamic efficiency to denote efficiency ratio should be discouraged as leading to needless confusion.) In whatever sense the term was used, the writer is unable to agree with the statement, as it is contrary to the test results available at present. The statement may become true as design progresses, but the time is not yet. The writer regrets that he is unable to accept Mr. Kaula's estimate of from 7 to 8 per cent. better steam consumption for the respective cases until reliable test results are available in support thereof.

Mr. Kaula contends that test results on the same turbine at different terminal pressures are misleading. This contention only holds good if the turbine is designed for a higher terminal pressure, or lower vacua, than that at which the tests are made. If the turbine is designed for the lowest terminal pressure at which the tests are made, as was the case in the article, then the results are truly comparative. This is amply demonstrated by the characteristics of the consumption-terminal pressure curves in the article. In fact, it is the only practical way of determining the value of advances in the design of the exhaust end of turbines.

The letter of Mr. E. Fawssett in your issue of March 4th gives somewhat better test results than those in the original article. The writer has the privilege of being conversant with the resources and ability of the test department controlled by Mr. Fawssett, and has no hesitation in accepting the figure put forward, namely, 6 per cent. at full load, as accurately representing a value achieved on a large-sized modern turbine. The result quoted would have been more helpful still if the size of the unit, the initial steam pressure, and the percentage of steam bled off for feed heating, had been given. The writer surmises that the capacity of the sets in question was from 20,000 to 25,000 kW, that a very appreciable amount of bleeding was part of the design, and that the sets were put into commission last year. The machines on which the results of the article were based were of 12,000 kW (economical load) and were put into commission in 1921 (scarcely ten years old as stated by Mr. Fawssett), so that in five years, with the turbine size doubled, and with the development of extensive bleeding (the latter appreciably affects the gain due to terminal pressure), the gain realised is still appreciably short of the theoretical, and is still only about 60 per cent. of that claimed over ten years ago, when the actual results were not so good as those shown in the article. Incidentally, the test value quoted by Mr. Fawssett is appreciably lower than that claimed by Mr. Kaula, and there can be little doubt about the size and modernity of the sets in question.

It should be pointed out that the value quoted by Mr. Fawssett almost certainly represents the maximum gain that can be realised at present for the largest-sized turbines, and that this maximum will not be realised with turbines of smaller capacity; also it does not follow that turbines even of the same, or larger, size by other makers will necessarily realise an equal gain. All the power stations are not going to be equipped with such large-sized turbines, for some years at any rate. It should also be pointed out that as initial steam pressure increases (the modern tendency) the gain due to terminal pressure decreases.

With the definite modern trend towards increased initial steam pressure the gain due to decreased terminal pressure falls successively, as is illustrated by the following table based on Callender's heat-drop tables:—

Theoretical Decrease in Steam Consumption due to Decreasing Terminal Pressure from 1.8 in. Hg. to 0.9 in. Hg. abs.

Initial Superheat Constant at 200 deg. F.

Initial pressure, lb./sq. in. gauge	400	600	800	1,000	1,200
Theoretical gain, per cent....	6.9	6.4	6.1	5.8	5.6

Taking account of the modern trend toward increased initial pressure, it will be realised that the figure quoted by Mr. Fawssett practically represents the highest gain to be achieved, for advances in turbine design will be more than negatived by the decrease in the heat drop as initial pressures increase.

Summing up, on the evidence available, it may be said that at the present time the value of river water as compared with cooling towers will vary from about 4 per cent. with medium-sized turbines to about 6 per cent. for the largest size of modern turbines.

Mr. Fawssett's letter was welcome as giving authentic test results. It does not nullify the objects of the article, but helps to carry the matter a stage further, the objects being to investigate the actual gain due to using river water, and to point out that the actual gain was usually considerably over-estimated.

Stoke-on-Trent, *March 9th*, 1927. **J. N. Waite.**

The "H" Type of Cable.

In view of the recent controversy in your columns regarding 33,000-volt cable, with particular reference to the "H" type cable, it is interesting to note that, in connection with the electrification of the Berliner Stadtbahn, orders have just been placed for 265 km. of 30,000-volt three-core cable.

Of this quantity, 184 km. is specified to be of the "H" type, the sections being 120 sq. mm. and 95 sq. mm., and 81 km. of the normal or belted type, the sections being 70 sq. mm. and 25 sq. mm.

The cable is to be manufactured in lengths of 800 metres.

London, *March 8th*, 1927. **E. Bowden.**

Two-Part Prepayment Meters.

I am pleased to note that Mr. Howell's remarks, and my own, at the last E.D.A. meeting, have received the attention they deserve, and that the Meter Engineers' Technical Association has set up an Expert Committee to deal with this very important question. It is about 12 months since I brought this matter up, and there was promise then of some form of British-made "two-part prepayment meter" coming on the market. For some reason this has not yet been given to us.

There are at least three makes of Continental meters of this type available, and in use in thousands, to my knowledge.

My own opinion is that the two-part prepayment meter is a real necessity, particularly with assisted wiring schemes and two-part tariffs being taken up by supply authorities. I maintain that the consumer would put 5s. or 6s. a month in the meter at once, by way of a fixed charge, if he had to, just as much as he would pay the rent once a month, and, moreover, if the small consumer knew he had to put the money in the meter for the fixed charge, before he could get current, he would do so. This is only a matter of education and custom. By asking for the fixed charges through a collector, the consumers can, and often do, say they will pay next month, and often run up a debt.

If the patent rights of those meters already being manufactured are the stumbling-block, then I suggest that our manufacturers should do the same as some Diesel-engine makers do, and take out a licence to manufacture in this country one of the already patented meters of the type required.

I hope the Meter Engineers' Expert Committee will draw a "winner" from our British meter manufacturers. I think they have a "sporting chance."

H. W. Watts,
Resident Electrical Engineer.

Electric Light Department,
Epsom, *March 7th*, 1927.

Power Supply for Wireless Sets.

The difficulty between Mr. P. K. Turner and "Interested" appears to me to admit of a comparatively simple explanation.

It is a fact of observation that to produce a material increase in volume of *undistorted* reproduction necessitates an increase in power-valve (output) capacity which appears to be considerably greater than in proportion to the resulting increase in volume. It is possible to have undistorted reproduction with quite a small power (valve), *e.g.*, 4 mA at 120 volts (*i.e.*, 0.48 watt) as quoted by "Interested," or even with an ordinary receiving valve, at a relatively moderate volume, but it is essential for a large volume of undistorted reproduction to have a large power (valve) consuming, say, 20 mA at 200 volts (*i.e.*, 4 watts) as quoted by Mr. Turner. In my own case, for satisfactory operation of two or three speakers, each with a good volume, I use no less than 24 mA at 250 volts (*i.e.*, 6 watts) (LS.5 valve).

It is hardly necessary to confirm Mr. Turner's contention of the self-evident absurdity of comparing reproduction of *equal* volume when utilising a small power and a large power respectively, it being clear that if a large power valve is worked just within satisfactorily undistorted volume, a small power valve would be overloaded on the same *output* and would cause distortion.

There is another thing to take into account in this matter, and that is that our own estimation of volume varies according to circumstances. When everything has been and is quiet it is possible in an ordinary room to enjoy quite low-power undistorted reproduction, and even imagine that it is loud; but in other circumstances it is very necessary to have much louder reproduction, for which there can be no question but that the contention of Mr. P. K. Turner is correct.

E. Fowler Clark, B.A., B.Sc., A.M.I.E.E.

Derby, *March 10th*, 1927.

Although I stated that my last letter should be the final one in connection with the above question, I trust that you will find room for this in reply to one from Mr. Turner in your issue of March 11th.

In the first place, I certainly do not agree with Mr. Turner's idea of a comparative test; in spite of the quite voluminous correspondence that has taken place it is evident that Mr. Turner has not yet quite grasped my contention, and I trust that I may be allowed to recapitulate a little.

This very interesting correspondence, from its inception and before Mr. Turner or I entered the field, dealt quite definitely with BROADCAST receivers, by which I understand the ordinary commercial set, or home-constructed set with commercial components, and not laboratory instruments. I have endeavoured to keep it on these lines, and it will be remembered that the statement to which I originally took exception was as follows: "Our own receivers," said Mr. Turner, "consume from 13 mA in the 2-valve type to 20 mA in the larger receivers, below which it is impossible to obtain good reproduction." This I maintained was excessive and unnecessary in a broadcast receiver, and I stated that I could get "distortionless" (later amended to "pleasing") results with an expenditure of 8 mA only on a 4-valve receiver. I pointed out that in addition to this, the receiver I was using employed three transformers in the low-frequency amplifier (incidentally, it also dispenses with grid batteries), which was also not in agreement with Mr. Turner's views.

My next contention was that the final test of the quality of reproduction of a broadcast receiver is the competent human ear. A person buying a broadcast receiver does not take it to a laboratory for test and to study wave-forms; but I agree that the tests for a laboratory instrument might be those suggested by Mr. Turner. We are not, however, concerned with these at the moment, as the discussion deals with broadcast receivers only.

I have the greatest respect for Mr. Turner's qualifications, and do not propose to enter into any discussion with him on the research side, but to confine myself to the commercial side. I am very sorry that the name of the makers of the receiver that I am using was mentioned by Mr. Turner, although that in itself is a guarantee of the excellence of the instrument, but praise or criticism of definite commercial products in a correspondence column is not as a rule very edifying.

If Mr. Turner will carefully read my letters he will find that my claim for "equal performance" will amount to this: that my standard commercial broadcast receiver, consuming 8 mA with four valves, will give equal performance to any other equally standard instrument consuming 20 mA or more. He cannot seriously think that I would compare a commercial receiver with a laboratory instrument, especially in view of my "humorous" reference to museum specimens.

My idea of a test would be to take the two receivers to be compared, each with their own loud-speakers, &c., to various parts of the country, the more difficult the position the better, and there demonstrate the two instruments to a group of persons competent to judge on aural results alone. Questions of strength or selectivity *must* enter into the test conditions of a broadcast receiver, and the tests described by Mr. Turner, although interesting, are hardly those to which commercial receivers should be submitted, and would convey nothing to the unfortunate individual who may be considering the purchase of a receiver and will have to pay the running costs if it has a consumption of 20 mA.

Interested.

March 11th, 1927.

[This correspondence may now be regarded as closed.—EDS. ELEC. REV.]

Portable Domestic Appliances: Earthing and Flexibles.

We are very glad to see that the question of domestic earthing is being discussed freely in the technical Press. Mr. Joshua Rose sums up the matter briefly; but his statement is adequate, because the necessity of providing complete protection against shock in the home is so obvious that no more is required to secure agreement than the mere mention of it. The aim of all electrical manufacturers should be to ensure the safety of the consumer, and Mr. Rose's suggestion that the Institution of Electrical Engineers should place this matter before the Home Office is a very sound one.

We take this opportunity of referring to your short editorial article, entitled "Faults in Flexibles," appearing on page 374 of your issue of March 11th, and of supporting you heartily in your reminder that here, as always, prevention is better than cure. As a result of our careful and prolonged consideration of methods of preventing these annoying troubles, we have adopted, as is well known, the use of cab-tire-sheathed flexibles for all our plugs to the entire exclusion of ordinary flexibles, which are much too weak mechanically to be satisfactory; and our further provision of a short length of flexible metallic tubing surrounding the sheathing at the point of entry to the plug removes the last chance of breakdown. As you rightly point out, faults in flexibles, though small things in themselves, are very irksome to users, especially if they are frequent; they are therefore a possible hindrance to the extended domestic use of electricity, and as such should be rendered impossible.

A. Reyrolle & Co., Ltd.

Hebburn-on-Tyne, *March 11th*, 1927.

Faults in Flexibles.

I suggest that the writer of the leaderette under the above title, in your issue of March 11th, does not read the advertisements in your journal. Or if he does read them, he has overlooked or forgotten that we manufacture and have advertised our "Thermoid" flexible cord, which is designed to overcome faults due to the continual bending of the cord, particularly at the point of entry. "Thermoid" flexible cord has been used with much success on all kinds of portable apparatus, since we introduced it more than ten years ago. It has a cotton-covered conductor of combined steel and copper wires which is insulated with vulcanised india rubber; two twisted cores are made circular with cotton wormings, braided with worsted and finished with glace cotton braid. It is a strong, well-padded flexible cord which does not kink and which does not support combustion. We make it also with asbestos serving instead of worsted braiding.

You complain that manufacturers do not devote enough attention to this matter of flexible cords for portable apparatus, but we trust that after this explanation you will credit our company with having made an effort to overcome the trouble.

Where we seem to have failed is in getting everybody to read our advertisements and literature, and to take action when they have read them.

W. A. Moore,
Advertising Manager,
W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.

London, *March 15th*, 1927.

[Our correspondent has made "a very palpable hit"; we congratulate his firm on the design of its flexible cord, of which we shall make trial.—EDS. ELEC. REV.]

A Metering Problem.

With reference to the letter from your correspondent "E.H.K.P.." which appeared in your issue of March 4th, and to the two letters on the same subject in your current issue, we would like to draw particular attention to Mr. Frank Rostron's remarks to the effect that "all the information necessary to ensure arrival at the correct conclusion is not available."

It would appear that they apply with particular force to the present case, for we have the strongest possible reasons for believing that the Aron meter concerned had never been correctly connected to its transformers, with the inevitable result that the meter combination "has never read correctly," and we may here state that large under-registrations are generally traceable to this cause rather than to inaccuracies in the meters themselves.

Aron Electricity Meter, Ltd.
F. A. NIELD.

London, *March 11th*, 1927.

With reference to "E. H. K. P.'s" metering problem, it is rather unfair to condemn one meter and state the other to be correct when, with a portable standard meter, no two read alike, unless the supply company has tested the Sangamo, which appears to me unlikely. I think the quickest way out of the difficulty would be to send the portable standard to some neutral testing department, such as the School of Technology, which would give a more satisfactory conclusion. I may state that it is not common practice to connect other makes of meters and transformers together, first, because at the makers' each meter is tested with its own set, and, secondly, taking this case in point, the makers would not guarantee their meter with any other make of transformer.

March 8th, 1927. **F. J. M.**

Supply Undertakers' Regulations.

We have just had our first experience with the County of London Electric Supply Co., which has recently started supplying electricity in this district. For a small private-house wiring installation carried out by us we had adopted our usual practice of putting in a consumer's ironclad combined main switch and fuse. After the undertakers had laid in their cable and fuses, they flatly refused to connect, or install, the meter, or even test the wiring, until this switch and fuse was replaced by separate articles, it apparently being their regulation that the meter must be connected between them. They require the consumer's switch to protect their meter, and insist that the consumer's main fuse shall be on the consumer's side of the meter.

We, and others that we have referred the matter to, have never heard of such a requirement, and apart from questioning the desirability of such an arrangement and the undertakers' power to insist on it, surely it is a patent absurdity not to allow the consumer's fuse to be on the undertakers' side of the meter as well as the switch.

If this regulation can be enforced, it means that the ironclad combined switch and fuse—quite a recognised and sound piece of apparatus—is entirely ruled out and will not be allowed by these undertakers. We should like to have your readers' opinions on the matter, and to hear what can be done to enforce the provision of a supply if the requirement is illegal.

Wanstead, *March 5th*, 1927. **C. & E.**

A Handicap to Electrical Progress.

I would appear to have interested a kindred spirit in "F. Curius Dentatus," who replies to my letter in a parable. He infers that I am amused at something that is not new, counsels moderation, advises people, when asked for absurd deposits, not to complain; and urges that supply authorities do not understand business in the ordinary sense.

I do not agree. The fable of supply authorities not being business people died years ago. There is a jest, but what Kipling called "a bitter jest," in this subject, of which "F.C.D." misses the point. I still claim to have discovered a new incident, and for the benefit of all other busy electrical engineers, who to my surprise up to now have taken no notice, I will endeavour to put the point in the plainest English:—

Leicester, a progressive city in the prosperous Midlands, population about a quarter of a million, possesses up-to-date gas and electricity supplies. These are directed by a committee of some of the finest business men in the city, whose policy is carried out by a recognised business manager. This body announces to citizens, and so to the world, that the deposit it requires for gas lighting and cooking in a house is £2; and for part lighting only the same house by electricity, £5.

Logically, there is only one conclusion: Its opinion, based on knowledge, practice, and experience, is that *electricity for household use is more than two-and-a-half times as dear as gas.* The strange fact also exists that, in spite of this opinion, which it backs to the extent of refusing business, it still wastes money on propaganda and allows the E.D.A. to do likewise. One at least hopes that the rest of the gas industry is not aware of the convictions of Leicester.

Cardiff, *March 7th*, 1927. **Ivan Fawcett.**

Ferranti and Edison.

Like many, I expect, I was much interested and very pleased to read your article relative to the election of Ziani de Ferranti to be a Fellow of the Royal Society—a most worthy acknowledgment of a very worthy man; but what interested me almost as much was the coupling of his name with that of Edison.

I wonder how many there are to-day who remember the advent of each in this country, and had the privilege of coming into personal contact with both. How widely different were the two men—Ferranti a self-reliant personality who depended entirely upon himself—it seemed just the opposite with Edison. True, I saw a good deal more of Ferranti, and only some years later became associated with Edison—I think it was Jubilee year—whereas my interests with Ferranti ended in or about 1884.

I know, however, I was not alone in taking a comparatively detached view of Edison, compared with Ferranti, the reason being, I think, that one rarely heard the name of Ferranti except "on his own," whereas Edison seemed always to be coupled with someone else, in spite of the fact that Edison was some 14 or 15 years the older. Take the Edison-Bell telephone, the Edison and Swan lamp, and the Edison-Hopkinson dynamo as a few only of many instances.

The only "combine" I remember of Ferranti's—an almost commercial necessity—was Ferranti, Thomson & Ince, and even this, I rather think, was almost a marriage combine. But the doctor's early times were by no means all honey, and many were the anxious days and nights spent in Appold Street and elsewhere.

The present generation must not forget that in those days we worked with about 50 volts; induction was practically unknown; and as for "phasing"—no one had heard of it. So much greater therefore the credit to the man who overcame all difficulties—so to speak—single-handed.

Luton, Beds., *March 8th*, 1927. **Harry South.**

The Salaries of Engineers.

The correspondence on this subject which you have recently published has been of considerable interest to the members of this Society, which was founded with the purpose of improving economic conditions within the engineering profession.

There can be no two opinions on the question of the general average of engineers' salaries: that it is deplorably low is beyond dispute. The Salary Census taken by this Society in 1923 and again in 1925 showed that, bearing in mind the nature of their work and the time and expense of their training, engineers belonged to one of the worst-paid professions. The figures were published in your columns at the time, but we will be pleased to supply them to any inquirers who may care to write to us for them.

The task of attempting to improve matters is a slow and difficult one. If engineers would create for themselves a representative protective body, similar to the British Medical Association, that task would be rendered easier. The scientific institutions cannot be got to move in the matter; they take the view that to do so would be outside the scope of their activities.

This Society has come definitely to the conclusion that the surest and soundest method of raising the status of the profession is the statutory enactment of a comprehensive measure of registration for engineers. The Engineers' Bill now before Parliament has been prepared and put forward by the Society as its chief contribution to the solution of the present economic difficulties of the profession. If all those who are interested in raising the status of engineers would help us in furthering the progress of the Engineers' Bill, with a view to its early passage into law, they would be doing something practical towards the raising of salaries.

Society of Technical Engineers,
Richard Hazleton, *Secretary.*

London, *March 11th*, 1927.

I have followed with great interest the letters in your "Correspondence" columns on the subject of engineers' salaries.

The failure of the I.E.E. to defend itself against the charges of indifference levelled against it is a striking proof of the lofty contempt with which that body persistently treats the vast majority of its members. The Institution, by its silence, admits that it is willing to accept the subscriptions of hundreds of underpaid electrical engineers, whilst caring nothing about their welfare. The Benevolent Fund is a good scheme, but the vast majority of the members of the Institution simply cannot afford to support the Fund. It is consequently hopelessly inadequate; but it could be made unnecessary for such a fund to exist, if the members of the Council would take an interest in the rank and file of the Institution.

Your last correspondent was right when he laid part of the onus on the employers, but the manual worker found out half a century ago that the employers of this country could not be taught morality unless there was force at the back of the teaching. We see the result to-day in the advanced Socialism of the manual workers. In America the employers have realised that to have contented employés is sound economy. In this country, on the contrary, our employers are driving their technical staffs more and more into the Socialist ranks. When that party realises the readiness of thousands of middle-class people to support a moderate Socialist policy, it will sweep the country. The employers will then have only themselves to thank if they find themselves in trouble.

Transmission.

March 12th, 1927.

With reference to the letters in your columns *re* engineers' salaries, I would thoroughly endorse the sentiments expressed by these martyrs to electrical science, who have spent much money and time on education in order that their employers may reap a rich harvest.

These "poor blighters" have given up to study many weary hours after their daily task has been completed, which might have been used for healthy recreation.

Surely it is the conditions from which these Human Documents that you have published have arisen, which give rise to Socialistic tendencies, and it is not surprising to find that comment has been withheld by the bodies concerned, as doubtless they have been justly put to shame.

March 11th, 1927. **Delta Star.**

The Birmingham Electric Club.

Annual Dinner.

THE sixteenth annual dinner of the Birmingham Electric Club was held at the Grand Hotel on March 11th.

Mr. A. C. BAKER, chief engineer of the Birmingham Corporation Tramways, in proposing "The Electrical Industry," commended the Electricity Act as having been devised to provide the greatest good for the greatest number. The electrification of railways had not developed as rapidly as some of them wished. Fortunately, however, there was a move in certain directions, although nothing had yet happened, towards the electrification of main lines. He thought it was only a matter of a short time before they would see some development in that direction. The speaker declared that tramways were not likely to be scrapped for many years to come. Tramways in this country used about 700,000,000 kWh of electricity annually, costing about £3,500,000. If tramways were scrapped, the electrical industry would lose a good customer.

Mr. GEORGE VERITY, in responding, said he believed an era of great prosperity was coming through the agency of the Electricity Act, the publicity given to the industry, and the forward movement all along the line. Initiative and enterprise had placed the electrical industry in the forefront. Household lighting, heating, and cooking would provide one of the greatest developments that the industry had experienced.

The civic toast was proposed by Mr. D. G. BROOKS (secretary of the club), who reviewed the inventions of famous Birmingham men in the realm of mechanics and combustion, to which the Lord Mayor (Ald. A. H. JAMES, C.B.E.) responded. Alluding to the national electricity supply scheme, his Lordship said its provisions in the main were excellent, but in their application one must necessarily have some regard to the welfare of local industries. He was glad to say that the Electricity Commissioners had sanctioned the continuance of the 25-cycle system in Birmingham.

Commander R. L. NICHOLSON, D.S.O., proposed the toast of "The Birmingham Electric Club," and the President (Mr. T. BIRKETT), in reply, said that the club brought together various interests for the common good of the industry.

Mr. F. FORREST, M.I.E.E., proposed the health of "The Visitors," and Col. J. F. LISTER, C.M.G. (chairman, South Midland Centre, I.E.E.) responded.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1925.

20,528. "Multi-channel telegraphy." F. E Pernot. August 15th, 1925. (266,268.)

20,794. "Method and arrangement for directional transmission and reception by means of electric waves." W. Hahnemann. October 29th, 1924. (Addition to 237,909.) (242,236.)

23,311. "Electrical hair or massage brushes." A. Lloyd. December 30th, 1925. (266,269.)

26,119. "Electric condenser arrangement." Etablissements Merlin & Gerin (Soc. Anon.). January 30th, 1925. (246,799.)

27,781. "Telephone systems." Standard Telephones & Cables, Ltd., J. H. E. Baker and J. R. Hardwick. November 4th, 1925. (Cognate applications, 28,214/25, 28,215/25, 31,774/25, and 31,775/25.) (266,026.)

28,161. "Thermionic valve-amplifying arrangements." M. Graham, A. Graham (legal representatives of E. A. Graham (deceased)) and L. H. Paddle. November 9th, 1925. (266,029.)

28,209. "Automatic electrical switching devices." W. J. Gladitz and E. C. Hohs. November 10th, 1925. (266,031.)

28,617. "Electromagnetic switch." C. Bruynis. November 13th, 1925. (Convention date not granted.) (243,007.)

28,627. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and D. A. Christian. November 13th, 1925. (266,037.)

28,872. "Electrolytic separation of metallic chromium." F. W. Würker. November 16th, 1925. (266,045.)

28,906. "Self-feeding electrically-heated water boilers." Jackson Boilers, Ltd., and H. Hargreaves. November 17th, 1925. (266,048.)

28,926. "Testing of automatic and semi-automatic telephone exchanges." Standard Telephones & Cables, Ltd., and A. H. Cameron. November 17th, 1925. (266,270.)

29,015. "Selecting switches for use in telephone exchange systems." Standard Telephones & Cables, Ltd., and G. Deakin. November 17th, 1925. (266,054.)

29,040. "Electrical wave filters." Standard Telephones and Cables, Ltd. (Bell Telephone Laboratories, Inc.). November 17th, 1925. (Patent of addition not granted.) (266,055.)

29,267. "Telephone exchange systems." Standard Telephones & Cables, Ltd. (Bell Telephone Laboratories, Inc.). November 20th, 1925. (266,062.)

29,268. "Telephone exchange systems." Standard Telephones & Cables, Ltd. (Bell Telephone Laboratories, Inc.). November 20th, 1925. (266,063.)

29,383. "Magnetic alloys and their application in the manufacture of telegraphic and telephonic cables." W. S. Smith and H. J. Garnett. November 20th, 1925. (266,066.)

29,992. "Thermionic transmitters and receivers." G. Schotel. November 27th, 1925. (266,068.)

30,115. "Telephone loud-speakers." S. G. Brown. November 28th, 1925. (266,271.)

30,249. "Electric inductance coils." E. L. Wildy and London Electric Wire Co. & Smiths, Ltd. November 30th, 1925. (266,071.)

31,766. "Electrical contacts." British Thomson-Houston Co., Ltd., H. Trencham, and H. C. Heath. December 16th, 1925. (266,086.)

32,061. "Diaphragmless microphones." E. Reisz. August 11th, 1926. (Convention date not granted.) (258,542.)

1926.

817. "Device for extinguishing discharge tubes functioning as switches." Siemens & Halske Akt.-Ges. January 12th, 1925. (245,804.)

1,016. "Electrical regulator systems." C. Filmer and Metropolitan-Vickers Electrical Co., Ltd. January 13th, 1926. (266,103.)

1,858. "Electric gland couplings." Walsall Hardware Manufacturing Co., Ltd., A. E. Read, and A. E. Millard. January 22nd, 1926. (266,109.)

2,380. "Electric switches." A. N. Penman and Norwest Electrical Manufacturing Co., Ltd. January 27th, 1926. (266,110.)

2,527. "Electric motors." W. Parry, S. Dale, and Metropolitan-Vickers Electrical Co., Ltd. January 28th, 1926. (266,111.)

2,713. "Adjusting mechanism for condenser dials, coil holders, and like electrical apparatus." J. Hester. January 30th, 1926. (266,113.)

5,614. "Electric discharge tubes and apparatus for producing flash s." L. Seguin and A. Seguin. March 5th, 1925. (248,743.)

7,523. "Electric heating elements." General Electric Co., Ltd., A. Kinnes, and M. S. H. Hunt. March 18th, 1926. (266,151.)

7,686. "Electric furnaces for melting or producing glass, water-glass, Portland cement, aluminous cement and other substances." C. E. Cornelius. March 23rd, 1925. (249,554.)

8,262. "Electric furnaces." British Thomson-Houston Co., Ltd. March 26th, 1925. (244,880.)

8,472. "Storage battery box." L. A. Doughty. March 29th, 1926 (266,157.)

8,612. "Rheostats and the like." E. J. L. Delfosse and Ormond Engineering Co., Ltd. March 30th, 1926. (266,161.)

9,443. "Flywheel magnetos." Soc. d'Applications et de Fabrications Industrielles Safi. June 12th, 1925. (253,484.)

10,153. "Receivers of high-frequency electric energy." S. Y. White. April 18th, 1925. (250,967.)

10,777. "Amplifying device for radio apparatus." Dubilier Condenser Co. (1925), Ltd. October 1st, 1925. (259,176.)

12,118. "Electric ignition apparatus for internal-combustion engines." F. C. Perrem. May 11th, 1926. (266,174.)

12,489. "Elimination of disturbing oscillations in radio signalling systems." L. M. Jackson (Lorenz Akt. Ges., C.). May 14th, 1926. (266,178.)

12,729. "Automatic telephone systems." Deutsche Telephonwerke und Kabelindustrie Akt.-Ges. December 17th, 1925. (263,079.)

12,730. "Automatic telephone systems." Deutsche Telephonwerke und Kabelindustrie Akt.-Ges. December 17th, 1925. (263,080.)

13,694. "Sound-reproducing diaphragms." Brandes Laboratories, Inc January 7th, 1926. (264,120.)

14,067. "Control of electric generators and interconnected motors." British Thomson-Houston Co., Ltd. June 3rd, 1925. (253,127.)

14,261. "Safety device for series-connected incandescent electric lamps." F. Eckhardt and M. Hohnekamp. February 20th, 1926. (266,185.)

14,553. "Electric incandescent lamps." British Thomson-Houston Co., Ltd. June 9th, 1925. (253,535.)

15,027. "Systems of electric supply and distribution." British Thomson-Houston Co., Ltd. June 15th, 1925. (253,561.)

16,764. "Magnetic core, more particularly for Pupin coils." Allgemeine Elektricitäts-Ges. July 6th, 1925. (254,749.)

17,161. "Electrical heating." J. Barrett and R. F. Wright. July 8th, 1926. (266,199.)

17,859. "Regulation of asynchronous electric machines." Siemens-Schuckertwerke Ges. July 17th, 1925. (255,480.)

17,877. "Switch arrangement for electric lighting installations and the like." R. Hurlimann. July 16th, 1926. (266,203.)

23,168. "Diaphragms for magnetic telephone receivers." L. Kilborn. September 20th, 1926. (266,236.)

23,191. "Electrical contact plug." W. Hesse. September 18th, 1925. (258,622.)

23,403. "Insulated electrical conductors." C. B. Backer. October 9th, 1925. (259,552.)

25,291. "Electric arc furnaces." International General Electric Co., Inc. October 9th, 1925. (259,615.)

26,397. "Wire-wound resistors." Dubilier Condenser Co. (1925), Ltd. April 14th, 1926. (266,248.)

27,230. "Head telephones." H. Kuchenmeister. February 17th, 1926 (266,252.)

27,347. "Apparatus for injecting water and air through the sparking plug electrode and into the cylinder of internal-combustion engines." H. Fischer. November 2nd, 1925. (Addition to 244,090.) (260,629.)

27,688. "Devices for disconnecting electric overhead conductors in case of breakage." J. Elser. November 4th, 1926. (266,255.)

29,016. "Electric couplings." J. Sax & Co., Ltd., and R. Ball. November 17th, 1926. (266,262.)

30,360. "Electric drives for vehicles." Soc. Anon. des Ateliers de Secheron. January 13th, 1926. (264,463.)

31,598. "Sound-recording and reproducing apparatus." De Forest Phonofilms, Ltd. December 19th, 1925. (263,180.)

33,082. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). September 9th, 1925. (Divided application on 263,969.) (266,266.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within month from March 9th. In the case of foreign applications, the names and addresses of the British representatives are also given :—

Spotter. No. 472,913. Class 8. Electric batteries.—P. Schmidt, trading as the Elektrotechnische Fabrik Schmidt & Co., Berlin. (Wheatley and Mackenzie, 40, Chancery Lane, W.C.2.)

Octron (lettering and design), No. 475,562, all goods in Class 8; and Cetron (lettering only), No. 475,560, and No. 475,564. Class 18. Electric alarms (as systems in buildings) and complete lighting sets for vehicles.—Octron, Ltd., 32, Charlotte Street, Birmingham.

Blue Spot-Marblock. No. 475,883 Class 8. Instruments and apparatus for use in radio-telephony and telegraphy.—Ideal Radio-telefon und Apparate Fabrik Gesellschaft, Berlin. (Lewis W. Gould, 5, Corporation Street, Birmingham.)

Ancahevea. No. 476,717. Class 8. Electric cables.—Callender's Cable and Construction Co., Ltd.

Mon Gallia (lettering and design). No. 473,491. Class 40. Caoutchouc in plate, strip and moulded form and accumulator casings made therefrom.—Compagnie Générale d'Electricité, Paris. (Cruikshank & Fairweather, 65-66, Chancery Lane, W.C.2.)

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—Reconstruction of theatre; manager, Aberdeen Picture Palace, Ltd.

ALDERSHOT.—Extensions to hospital, including X-ray department, for the Committee; S. Friend, architect.

ALMONDSBURY.—Mental colony; Bristol Medical Officer of Health.

BARNSLEY.—200 houses by direct labour; borough engineer.

BETCHWORTH (Surrey).—Alterations, &c., Wonham Manor, for Sir R. Butler, Bart.

BRADFORD.—Public hall; Special Corporation Committee. Central garage; city architect.

BRISTOL.—Housing scheme (110), St. Anne's site, flats, Eugene Street, and baths and wash-houses, Broad Weir (£65,000), for the T.C.; L. S. McKenzie, city engineer, 51, Prince Street.

BURTON-ON-TRENT.—56 houses; borough engineer, Winshill. Electricity supply, Woodville Pottery; Mansfield Bros., Ltd.

BURY (Lancs.).—Houses (200), for the T.C.; James Byron, Ltd., builders.

CARLISLE.—Billiard hall and assembly hall, Fisher Street; J. Leslie, architect. Extensions to bakery, Junction Street (electrical work), for the Co-operative Society; S. W. B. Jack, architect, Lloyd's Bank Chambers.

CHELTENHAM.—80 houses, Hanover Street; Mr. Malvern, borough architect.

CHESHAM (Bucks.).—Housing scheme (150), for the U.D.C.; the clerk.

CHESTERFIELD.—100 houses, Gloucester Road, and Tapton View Road, for Corporation; S. Higton & Sons.

COLCHESTER.—Extensions, Royal Grammar School, for Essex E.C.; J. Stuart, county architect, Springfield Old Court, Chelmsford.

DARLINGTON.—Town hall and municipal buildings; borough surveyor.

DARTFORD.—Bank premises, High Street, for Lloyd's Bank, Ltd.

DERBYSHIRE.—Agricultural institute, for the C.C. (£3,970); Walkerdine, Ltd., builders.

DONCASTER.—Sanatorium, Weston Road, for the T.C.; Dr. Adshead, architect.

DOUGLAS (I. of M.).—Municipal office accommodation; Special Corporation Committee.

DUMFRIES.—Additional 130 houses, Balmoral Park, for the T.C.; burgh surveyor.

EASTBOURNE.—40 houses, Victoria Drive; borough engineer.

EAST SUSSEX.—Mental colony; County Medical Officer of Health.

ELY.—Housing scheme (40), St. John's Road, for the U.D.C.; W. McKelvie, architect, Silver Street.

EXHALL.—Central school, Ash Green; A. C. Bunch, county architect, 27, Binswood Avenue, Leamington Spa.

FALKIRK.—Five blocks of houses for Falkirk Iron Co., Ltd. (£7,800); the manager.

FIFESHIRE.—Extensions at Kirkcaldy District Infectious Diseases Hospital (£2,500); J. Cameron, Thornton, chairman of Hospital Committee.

GARLANDS.—Extensions to Mental Hospital, for Cumberland and Westmorland Joint Committee (£20,000); the clerk, Carlisle.

GLASGOW.—Warehouse, &c., at 163-164, Sauchiehall Street, and 81-85, Renfrew Street, for Smith (Glasgow), Ltd., 84, Gordon Street; the manager. Garage at Govan (£11,000); city engineer. Stores and meter workshop, Sydney Street; Corporation meter engineer.

HARWORTH (Worksop).—Houses (164), for Barber, Walker and Co.

HAZEL GROVE (Stockport).—Joinery works, School Street, electrically equipped, for G. Fryer (£10,000).

HIMLEY.—Extensions, sanatorium (£11,110), for Staffs., Wolverhampton and Dudley Joint Committee for Tuberculosis; the clerk.

HULL.—Secondary school, Pickering Road; Education Committee. 250 houses, Trinity House Estate, for J. P. Backwell; F. Runton Waller.

INVERNESS.—Motor spirit depôt for Shell-Mex, Ltd. (£9,000); the manager, Aberdeen.

IRISH FREE STATE (Dublin).—266 houses on the Drumcondra and Glasnevin sites, for the City Commissioners; city architect, Exchange Buildings, Lord Edward Street.

IRVINE.—School (electric lighting) for Ayrshire E.C.; W. Reid, master of works, Education Offices, Ayr.

LANARKSHIRE.—Church at Cartcosh (£6,000); Rev. D. S. Mackenzie, Cartcosh.

LEYBURN.—Kinema, for A. P. Haigh, 2, St. Mary's Place, Barnsley.

LEYLAND (Lancs.).—Additional housing scheme (40), for the U.D.C.; surveyor. Extensions to works, for Leyland Motors, Ltd., Leyland Paint and Varnish Co., and J. E. Baxter & Co.

LONDON (Limehouse, E.).—Premises, Thomas Street, for Sanders Bros. (Stores), Ltd.; Higgins & Thomerson.
(Hendon, N.).—1,020 houses, Watling Estate, for L.C.C.; C. J. Wills & Sons, Ltd.
(S.E.).—Extensions, South-Eastern Hospital (£33,750); Metropolitan Asylums Board.
(Penge, S.E.).—School, Anerley, for the E.C.; the clerk.
(Woolwich, S.E.).—Houses (47), Postell Estate, for the Royal Arsenal Co-operative Society.
(Kensington, S.W.).—Premises, corner Finborough Road and Richmond Road; Sir Aston Webb & Son.
(Westminster, S.W.).—Buildings, Millbank; Imperial Chemical Industries, Ltd.
(Long Acre, W.C.).—Masonic temple, with lifts, &c.; H. V. Ashley, architect.

LUTON (Beds.).—Factory, Guildford Street, for A. Hucklesby, Ltd. Extensions to works, Kingsway, for B. Laporte, Ltd.

MANSFIELD.—Additional 124 houses, for the T.C.; borough surveyor.

NEWHAVEN.—41 houses, for the T.C.; Sherren, Ltd., Cooksbridge.

NEW MILTON (Hants).—Hotel (£12,000), for Mrs. S. A. Ellis; Wallis & Holding, Bournemouth, architect.

NEW ZEALAND (Dunedin).—Town hall for the City Council (£81,000).—*Reuter.*

NORTHAMPTON.—Showrooms and workroom, Mercers Road and Drum Lane; A. & L. Knight.

OLDBURY (Birmingham).—Additional 56 houses, Londonderry Farm site, for the U.D.C.; surveyor.

PONTEFRACT.—School (550 places), Baghill Housing Estate, for the Borough E.C.; borough surveyor.

POOLE.—100 houses, for the T.C.; borough engineer. Town hall, for the T.C.; E. J. Goodacre, borough engineer.

RENFREWSHIRE.—Halls for Thornliebank U.F. Church; the minister.

ROTHERHAM.—Additional housing schemes, Herringthorpe (1,000), for the T.C.; borough surveyor.

ST. AUSTELL.—Houses (50), for the U.D.C.; J. H. Lobb, builder, Mevagissey.

STEVENAGE.—Additional housing scheme (300), for the U.D.C.; R. Gandy, surveyor.

STRETFORD.—School, Low Moss Lane; Education Committee. Alterations, First Avenue; Ford Motor Co. (England), Ltd.

SUNDERLAND.—Housing scheme (216); borough engineer, Town Hall.

SWINDON (Wilts.).—Additional 100 houses, Hurst Estate, for the T.C.; borough surveyor.

TORQUAY.—38 houses, Windmill Hill; Seston & Guscott. 50 houses to complete Windmill Hill Estate; borough engineer. Extensions, tram depôt, Marychurch Road; Torquay Tramway Co., Ltd.

WALMER.—Houses (50), Downs Road, for Dennis, Ltd.

WEYMOUTH.—Re-erection of portion of the Gloucester Hotel; Mr. Finnegan, manager (several thousand pounds).

WORCESTER.—Factory, Diglis, for Lewis Beck, Ltd., Bexville Works; R. T. Earl, managing director.